METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD — COPPER AND BRASS

BRASS FOUNDER and FINISHER

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Institute of Metals Division Meeting

Papers on Theoretical Metallurgy. Symposium on Metals in the Petroleum Industry. Lecture on Gases in Metals. Talk on Tin and Civilization.

THE Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, held its annual meeting in New York, February 19-21, at the Engineering Societies Building, 29 W. 39th Street. The sessions were devoted largely to metallurgraphy and theoretical metallurgy, the meetings being fully attended and the discussions very interesting.

Several functions of special interest were held. The Annual Institute Lecture by Dr. C. A. Edwards, principal of the University College, Swansea, Wales, on the subject of Cases in Metals was delivered on February 21. At the Annual Division Dinner, held at the Commodore Hotel, D. J. MacNaughton, director of Research of the International Tin Research and Development Council, London, gave an address on Tin and Civilization.

Abstracts of the above addresses are given below.

Another event was the symposium on the Use of Metals in the Production and Refining of Petroleum. While steel is used to a considerable extent, nonferrous metals play no small part in the equipment for this industry.

New Officers

Henry A. Buehler, state geologist and director of the Missouri Bureau of Geology and Mines, was elected president of the A. I. M. E., for 1935. John M. Lovejoy and Dr. P. D. Merica, were elected vice-presidents. Dr. Merica has held this position for the

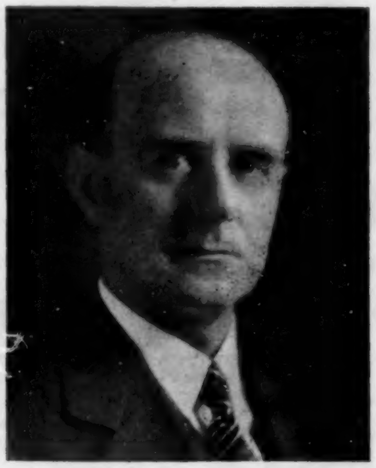
W. M. PEIRCE

Chairman Institute of Metals Division

E. H. DIX, Jr.

Vice-Chairman Institute of Metals Division

E. M. WISE
Secretary-Treasurer



O. W. ELLIS
Member, Executive Committee

W. H. BASSETT
Member, Executive Committee

past three years, and is well known throughout the United States and abroad for his work in non-ferrous metallurgy.

New officers for the coming year for the Institute of Metals Division were elected as follows:

Chairman, W. M. Peirce, New Jersey Zinc Company, Palmerton, Pa.

Vice-chairmen, E. H. Dix, Jr., Aluminum Company of America, New Kensington, Pa.

A. J. Phillips, American Smelting & Refining Company, Maurer, N. J.

Secretary, E. M. Wise, International Nickel Company, Bayonne, N. J.

Executive Committee for three years:

W. H. Bassett, Jr., Anaconda Wire & Cable Company, Hastings-on-Hudson, N. Y.

O. W. Ellis, Ontario Research Foundation, Ontario, Canada.

W. E. Remmers, Western Electric Company, Chicago, Ill.

Abstracts of the papers read and the lectures delivered are given below.

Abstracts of Papers

EMBRITTLEMENT OF URANIUM BY SMALL AMOUNTS OF ALUMINUM AND IRON

By H. W. Highriter and W. C. Lilliendahl.

It has been found that electrolytic uranium is embrittled by about 0.20% Al or about 0.5% Te, only lesser amounts when in combination. Small amounts of carbide have been found to be without adverse effect upon ductility.

The source of these impurities has been found to be the graphite crucible used for electrolysis, although contamination by the use of impure sodium and calcium chlorides for the electrolyte would be equally deleterous.

RECRYSTALLIZATION AND GRAIN GROWTH IN COLD-WORKED POLYCRYSTALLINE METALS

By L. W. Eastwood, Arthur E. Bousu and C. T. Eddy

Complete quantitative data are presented on the grain sizes of cold drawn and cold rolled alpha brass just after the complete recrystallization and after the coalescence produced by annealing. Several new principles are deduced which may disprove many current misconceptions. Of these principles the most important are:

1. The grain size just after recrystallization is dependent only upon the composition and history of the material prior to deformation and upon the degree of deformation.

2. All grain growth obeys the same laws, germination as such being non-existent since there is no discontinuity in the size of new grains produced.

3. Abnormality of grain growth is not, or usually not, produced by temperature gradients.

4. The large grains produced by annealing metals containing low degrees of strain are due to the large grains formed upon recrystallization rather than to the absorption of grains by "germinant grains" produced by a "critically strained" metal at the "germinant temperature."

5. Annealed, cold-worked metals which do not undergo an allotropic transformation have coarser grains with higher annealing temperature since rapid heating through the so-called "germinant temperature" to a higher temperature produces a coarser grain rather than a finer one.

ALUMINUM-COPPER-NICKEL ALLOYS OF HIGH TENSILE STRENGTH SUBJECT TO HEAT TREATMENT

By Paul D. Merica and W. A. Mudge

A new metal which combines the strength and hardness of alloy steels with exceptional resistance to corrosion and heat was announced. The new metal is called "Aluminum-Monel Metal" due to the fact that it is

much like Monel metal with 4 per cent aluminum added, and is designed to meet the stringent requirements of modern engineering materials. It is believed that this new aluminum-monel metal, possessing as it does such high strength and good mechanical properties, will be especially useful for such applications as turbine blades and pump rods. In general, the need for such a metal is in installations operating at high temperature, where resistance to corrosion is an important factor.

EQUILIBRIUM RELATIONS IN THE COPPER CORNER OF THE TERNARY SYSTEM COPPER-TIN-BERYLLIUM

By Elbert S. Rowland and Clair Upthegrove

This paper presents the results of an investigation of the equilibrium relations of certain alloys containing copper, tin and beryllium. The alpha-base boundary of the tenary system is given for alloys containing from 0 to 1 per cent beryllium. The equilibrium conditions beyond the alpha-base boundary are presented for alloys containing up to 32 per cent tin and 1 per cent beryllium. The data were collected by means of quenching experiments, microscopic examination and thermal analysis. The results of some powder-method X-ray determinations on the alloys, conducted by Mr. William Mikulas and Prof. Lars Thomassen at the University of Michigan, are used as evidence in this paper. The complete findings of their X-ray investigations will be published as a separate paper.

FREE ENERGY AND HEAT OF FORMATION OF THE INTERMETALLIC COMPOUND Cd-Sb

By Harry Seltz and J. C. de Haven

1. Thermodynamic properties of the intermetallic compound CdSb are determined by an electromotive force method.

2. For the reaction Cd(s) + Sb(s) = CdSb(s)

$$\Delta F = -3{,}486 + 1.067\ T, \text{ and}$$
$$\Delta F_{298} = -3{,}168 \text{ cals.}$$
$$\Delta H = -3{,}486 \text{ cals.}$$

3. The cutropy change in this reaction is small. $\Delta S_{298} = -1.1$ e. u., and for Cd Sb, $S_{298} = 21.8$ e. u.

STUDIES UPON WIDMANSTATTEN STRUCTURE, VII—THE COPPER-SILVER SYSTEM

By Charles S. Barrett, Hermann F. Kaiser, Robert F. Mehl.

1. A Widmanstatten figure may be formed in copper-rich copper-silver alloys by extremely slow cooling. The silver-rich preciptate takes the form of plates parallel to (100) planes of the copper-rich matrix.

2. The precipitate in silver-rich copper-silver alloys is usually a pearlitelike arrangement of irregular plates. By extremely slow cooling a Widmanstatten figure may be developed in which the copper-rich precipitate forms plates parallel to the (111) planes of the matrix.

3. X-ray data prove that there is an identical orientation of matrix and precipitate lattices in the copper-rich alloys. The same is true of the silver-rich alloys even when the outward form of the precipitate is like pearlite in appearance.

4. Previous theories for the mechanism of formation of Widmanstatten figures fail to explain these results. It is suggested that the usual mechanism is not operative and that a less frequent mechanism is involved. The nature of this mechanism is not known.

5. Numerous grains in silver-rich alloys, when quenched and annealed, recrystallize into a new set of orientations related to the orientation of the original grain. The new orientations may be derived from the original by rotations in two directions of 42° ± 5° about [100], [010] and [001] directions of the original lattice as axes. The recrystallization appears to be associated with the discontinuance change of matrix lattice dimensions during precipitation.

PHYSICAL AND CASTING PROPERTIES OF THE NICKEL SILVERS

By T. E. Kihlgren, N. B. Pilling and E. M. Wise

Systematic data are presented on the relation of composition of nickel silvers to color, tarnish resistance, hardness and liquidus temperatures, for alloys containing up to 30 per cent nickel and 50 per cent zinc, further modified at certain nickel and zinc contents by 0 to 8 per cent of tin and 0 to 10 per cent of lead. Attention has also been directed, using a still more limited range of alloys, toward a study of tensile properties and such casting properties and characteristics as fluidity, shrinkage and pressure tightness. In some of these, rather broad ranges of composition are dealt with; in others, it has been expedient to focus attention on the Federal Specification 20 per cent nickel silver casting alloy, WWP-541.

CRYSTALLOGRAPHIC UNIFORMITY OF LINEAGE STRUCTURE IN COPPER SINGLE CRYSTALS

By Alden B. Greninger

The interpretation of fine structure within individual spots on unsymmetrical back-reflection Laue photographs of copper single crystals indicate that such crystals possess a crystallographically uniform lineage structure.

Predominant relation between neighboring lineages is:

Common direction [110]
Interlineage boundary plane [111]

Less frequent relation is:

Common direction [100]
Interlineage boundary plane [110] or [100]

PROPERTIES OF THE PLATINUM METALS, 1—STRENGTH AND ANNEALING CHARACTERISTICS OF PLATINUM, PALLADIUM AND SEVERAL OF THEIR COMMERCIAL ALLOYS

By E. M. Wise and J. T. Eash

1. Pure (thermocouple grade) platinum reduced 50 per cent by cold drawing exhibits the following tensile properties; ultimate tensile strength, 36,000 lb. per sq. in.; proportional limit, 27,000 lb. per sq. in.; elongation, 2.5 per cent in 2 in.; reduction in area, 95 per cent. When fully annealed by treatment at 1100°C. its properties are: ultimate tensile strength, 20,700 lb. per sq. in.; elongation, 30 per cent in 2 in.; reduction in area, 93 per cent.

2. The addition of alloying elements in moderate amounts markedly increases the strength and annealing temperature without much detriment to the ductility.

The behavior and properties of variously hardened platinum alloys are considered in some detail. The

behavior of a 20 per cent iridium platinum is typical and such an alloy reduced 50 per cent by cold drawing exhibits an ultimate strength of 140,500 lb. per sq. in., a proportional limit of 101,000 lb. per sq. in., elongation of 2.5 per cent in 2 in., and reduction of area of 85 per cent; and after a softening anneal at 1400°C. develops the following properties: ultimate tensile strength, 93,500 lb. per sq. in.; proportional limit, 59,100 lb. per sq. in.; elongation, 20 per cent in 2 in.; reduction of area, 88 per cent.

3. Commercially pure palladium reduced 50 per cent in area by cold drawing exhibits an ultimate of 46,900 lb. per sq. in.; proportional limit, 31,800 lb. per sq. in.; elongation, 1.5 per cent in 2 in.; reduction of area, 91.5 per cent; and after complete softening by annealing at 800°C. develops the following properties: ultimate, 30,400 lb. per sq. in.; elongation, 39 per cent in 2 in.; reduction of area, 91.5 per cent.

4. Palladium hardened by the addition of 4 per cent Ru, 1 per cent Rh, reduced 50 per cent in area by cold drawing, exhibits an ultimate of 71,500 lb. per sq. in., proportional limit of 43,300 lb. per sq. in., elongation of 3 per cent in 2 in. and a reduction of area of 84.5 per cent; and after annealing at 800°C., an ultimate of 55,200 lb. per sq. in.; proportional limit of 21,100 lb. per sq. in.; elongation, 25.5 per cent in 2 in.; reduction of area, 84 per cent.

5. The elongations of all wires increase to a maximum and then fall more or less slowly with a further increase in annealing temperature. In some instances this fall is due to marked selective grain growth. The reduction of area is high in all cases and shows only a small change as a result of the annealing treatments.

6. The effects of time and annealing atmosphere upon the properties of pure palladium have been determined.

7. The optimum annealing temperatures for a variety of platinum and palladium alloys are indicated, together with the properties before and after these treatments.

MATERIALS USED IN OIL REFINERY PUMPS

By A. E. Harnsberger

In reviewing the material requirements of refinery pumps, every definite need of alloy steel and iron parts is disclosed. The only thing that restricts their use is their high costs. High costs cannot be attributed to excess profits but to lack of volume of any one alloy. Pump manufacturers should survey the entire chemical industry and determine whether the bulk of the conditions cannot be met by a few alloys that can be produced in larger quantities at lower costs. As costs lower, a still broader field of application will be found in the less corrosive services.

Non-ferrous alloys are recommended for the following parts:

Valves and valve seats in reciprocating pumps for cold service—Aluminum.

Valves and valve seats in reciprocating reflux pumps handling light oil fractions—Brass; Aluminum.

Casings for centrifugal reflux pumps handling light oil fractions—Bronze—75 Cu, 15 Pb, 10 Su.

Impellers for above—Bronzes, from Admirality formula to 75 Cu, 15 Pb, 10 Su; Monel.

Impellers for centrifugal absorption plant pumps—Bronze, 75 Cu, 15 Pb, 10 Su for non-corrosive conditions, (or 88 Cu, 10 Pb, 2 Su).

Centrifugal acid pumps—Bronze (acid resisting); Monel.

Reciprocating Acid pumps:

Fluid ends—Acid resisting bronze or red brass.

Liners—Bronze, 85 Cu, 10 Su, 5 Pb; Monel; A. S. T. M. Specification B-60 Bronze.

Pistons and piston rings—Acid resisting bronze; Monel.

Rods—Tobin Bronze; Monel.

Valves and valve seats—Tobin Bronze; Monel.

Cases, shafts and rotors for rotary acid pumps—Bronze (acid resisting); Monel; Tempalloy; Hard Lead (for cases).

THEORY AND USE OF THE METALLURGICAL POLARIZATION MICROSCOPE

By Russell W. Dayton

From a study of the metallurgical polarization microscope the following conclusions were reached:

1. Anisotropy can be detected in many instances where it should occur, the effects are very much smaller than in studies of transparent substances. Sometimes anisotropy should be present but is not apparent; owing either to the smallness of the anisotropy or to the presence of surface films.

2. Surface films were observed on the metal zinc.

3. Anisotropy due to strain could not be detected. As all anisotropic effects of reflection are small, it is probable that the effects are too small to be detected.

4. The instrument can be very useful in the identification of inclusions. It can detect either surface anisotropy or transparency of the inclusion if they are present in sufficient amounts. If both are present in detectable amounts, the intensity of one will usually predominate. Ways of distinguishing between anisotropy and transparency are given. Three general types of inclusions are illustrated.

CORROSION TESTS IN VARIOUS REFINERY SERVICES

By J. E. Pollock, E. Camp and W. R. Hicks

In the oil-refining industry, steel comprises by far the greatest proportion of the materials used in construction work, but with an enormous number of alloy steels and nonferrous alloys available, and a greater knowledge of their properties and corrosion resistance, a substitution first in the "hot spots" and then in locations of moderately severe corrosive conditions will be made as the greater expense can be justified.

Tables were given showing the results of metal tests in various corrosive media. The metals include a number of steels, brasses, bronzes, aluminum, zinc and nickel brass alloys.

TIN AND CIVILIZATION

By D. J. MacNaughton

(A talk at the Annual Institute of Metals Division)

The author cited the increase in the consumption of tin from 10,000 tons a year at the beginning of the 19th Century to 140,000 tons in 1934. The amount of tin used in this last year for tinplate was sufficient to supply a band of this material 100 feet wide girdling the earth at the equator, while the amount of tinfoil produced would be sufficient to coat a tower sixteen

miles high of the same dimensions as the Empire State Building.

Tin has been essential in conjunction with other metals in securing the effective transmission of energy to do work which has provided the material basis for civilization. It has contributed to the growth of towns by facilitating the transmission and storage of foods in containers. Tin has also contributed to the metal energy of man by its service in such arts and inventions as printing, telegraphy, telephony and radio, which necessitate the use of type metals, solders, bearing metals, etc.

Further industrialization of the world will be encouraged, because of tin and the metal will help do away with intense localization of these industrial areas by contributing to large-scale developments of electrical transmission of power.

(While not brought out in Dr. MacNaughton's talk, according to "Mineral Industry" deliveries of tin for 1933 were estimated at 100,751 tons against 77,075 tons the previous year and the United States received 21,495 tons of the 23,676 ton increase. Output from the four chief restricting countries—Malaga, Bolivia, Netherlands, East Indies and Nigeria, showed a reduction of a little over 11,000 tons in 1933, while there was an increased from Siam and the non-restricting countries of something like 3,000 tons.)

GASES IN METALS

By Dr. C. A. Edwards

(Annual Institute of Metals Division Lecture).

Gases are associated with metals in four ways:

1. Adsorbed gases
2. Dissolved gases
3. Gases in chemical combination
4. Gases entrapped in cavities, blow-holes, etc.

The author explained the condition of the metals in each case. He also covered the defects developed by the diffusion of hydrogen; influence of temperature and pressure on the solution of gases in metals, blow holes; influence of mars on rate of cooling; removal of gases by physical means.

Melting High Purity Aluminum

Q.—A proposition has come up which necessitates a one ton capacity furnace, extension, direct pouring, front type.

We have this type, both for crucibles and open flame; it would be about our size No. 96. However, I now understand that the job is pouring pure aluminum and aluminum alloy. The large part of the melting will be melting of aluminum of a purity over 99% and that city gas will be used. They are going to melt the foil that has gutta-percha. This is for use in tin foil virtually absolutely pure and to be used in connection with a new system of melting.

Regular casting methods would not do; i.e., regular melting of aluminum would not do. It would be all right for casting metal but not for rolling.

For the rolling of the aluminum into foil, we may have to use an electric furnace. The point is that we may use scrap aluminum and pig aluminum. I talked to our Gas Company but they say that even if the aluminum is pure, in the use of the open flame type of furnace the gas may have some sulphur in it; so we cannot guarantee. Maybe an electric furnace would do it.

A.—We are of the opinion that your crucible tilting type furnace would melt the metal free from impurities if the metal charged in the crucible is pure. We believe the problem is not so much the style furnace, as it is the heat control, so we suggest that you try out a heat in your regular crucible furnace, using the metal that is over 99% in purity and rig up a pyrometer in the furnace and do not let the metal get much over 1300°F. Temperature control is one factor which cannot be disregarded for this class of work. Control of temperature largely eliminates the solution of oxides and absorption of gases.

Care must be exercised in handling the metal. It should be conveyed with a minimum amount of sloshing. Any movement of the metal in the pouring crucible has a tendency to whip it and entrap air. The lip of the pouring crucible should be held close to the mold. Pouring from a height has a tendency to entrap air which is a factor that will be found in the finished product.

So we are of the opinion that if proper steps are taken to control melting temperature and purity of metal used and regulate pouring, you should produce a metal as pure as charged in the furnace which would be satisfactory for rolling foil.

We note that you say regular melting of aluminum would not do. Can't understand why as one company is said to produce aluminum wall paper and their product consists of a 40 pound tough craft paper with a solid sheet of pure aluminum mounted with asphalt. It is put up in rolls 24" wide by 25 yards long. Their metal must be pure.—**W. J. Reardon.**

Copper Tubing

Standard Specifications for Copper Water Tubing,[1] which it is expected will be used by other ASA committees in developing standards now under consideration, have been approved by the American Standards Association. Seamless copper tubes especially designed for plumbing purposes, underground water services, and also suitable for copper coil water heaters, fuel oil lines, gas lines, etc. are covered in the standard, with provisions for methods of manufacture, chemical and physical properties and tests, and standard dimensions and weights with permissible tolerances.

The specifications were prepared by the American Society for Testing Materials' Committee B-5 on Copper and Copper Alloys, Cast and Wrought, in response to widespread demand, and were adopted by the A.S.T.M. as standard in 1933.

It is expected that the Sectional Committees on Standardization of Plumbing Equipment (A40), Code for Pressure Piping (B31), and Safety Code for Mechanical Refrigeration (B9) will use the standard as one of several reference documents in connection with the development of standards under their jurisdiction.

Copies of these standards can be purchased or borrowed from the office of the American Standards Association, 29 W. 39 Street, New York.

[1] H23.1-1934; A.S.T.M. B88-33.

Making Strong Brass and Making Brass Strong

By MICHAEL G. CORSON
Consulting Metallurgist, New York

Practical Considerations in Producing Brass Castings and Forgings. Part 1.

THIS article is intended for the practical foundryman and the coppersmith, and no questions pertaining to the brass rolling mill will be discussed here.

A number of ordinary brass compositions are in use. The properties of the binary copper-zinc alloys change in such a gradual way that no one can indicate conscientiously whether a 32% or a 35% or even a 25% brass ought to be used to satisfy most properly a given need. Most frequently the costs and the chance to save a few pennies will provide the only valid consideration. In those cases where ornamental characteristics are of importance one might prefer the golden tinge of a 10% brass to the straight yellow of a 30% alloy.

Ordinary brasses are rarely if ever called to satisfy any rigid demands for strength. In spun and stamped articles the question of rigidity may be of importance, but this rigidity is gained exclusively by the reason of twisting the grains of the metal out of their normal geometrical structure during cold working. The rigidity so obtained depends on the elastic limit's increase due to this distortion of the grains and on the elastic modulus characteristic of the composition. No aluminum or silver alloy can be brought to the same rigidity as attainable for a copper base alloy, all other conditions being equal. On the other hand nearly all copper base alloys with grains of the copper or "alpha" type of structure have the same modulus of elasticity and therefore the maximum rigidity attainable for any one of them is almost constant. At any rate there can be no noticeable difference in rigidity in hard drawn tubings made of a 10 and a 30% brass.

Still we always desire to have our brass goods strong. This is quite logical for we have no better proof of the soundness of a metal than its ultimate strength value. No other feature is as striking and as comprehensible.

Therefore, the main question, whether in a foundry or in a smithy is: Here we have a brass composition. How can we obtain the maximum strength in our castings and forgings? There remain no other questions to be answered. It is fallacious to ask how to make an alloy non-porous or which composition will be more sound. For, unless an alloy is inherently brittle it always can be made to yield a sound casting or forging, provided the strength of the metal in the casting or forging is nearly coincident with the maximum strength attainable for the particular alloy in its annealed state.

Hence our first problem upon the way to the answer as to how to make our brass goods strong consists in finding what are the maximum characteristics for the given compositions.

Maximum Characteristics and the Structural Features of Ordinary Brasses

Many years have passed since the last systematic investigation of the properties of binary copper-zinc alloys took place. In those days there was no clear understanding of the influences of gases and of the phenomena taking place along the surfaces of the adjacent grains during their crystallization. Not even to-day can we claim a perfect understanding of these phenomena.

Small wonder therefore that our elders in their painstaking investigations made one grave error. They melted their mixtures in some way developed through decades of the application of the hit and miss method. They poured them in the same manner. Then they cropped off the heads of the billets with their visible shrinkage cavity and proceeded either to reduce the billet by rolling or else test it in the "as cast" state.

That is why all old data as to the characteristics of the **cast** brasses are of little value. It might appear, were these data true, that the functional relationship between composition and properties follows some most intricate and capricious law.

The reason for that straying of characteristics is now quite obvious. Most frequently the melts contained gases and they are liberated during solidification. This liberation needs not take the form of blowholes, pinholes, etc. even if it may sometimes do so. In such cases, however, one sees the unsound condition and can discard the bar right away. Microscopic liberation of gases pass by unnoticed, the bar is tested and a record of a low strength is the result.

Solidification in sand molds, being less rapid, tends to cause a far more pronounced liberation of the occluded gases, than one occurring in a chill mold. Hence the correct observation that sand cast metal is weaker than the chill cast one, and the wrong conclusion that this is due to the chilling effect, small grain etc., in the chill cast specimen.

The second reason is that a metal solidifies first in contact with the walls of the mold and so forms a shell filled with molten metal. This shell contracts on cooling (but none too strongly). Hence the liquid metal filling the shell up to a given level never can

fill its whole space after solidification unless more and more liquid metal runs down into the shell from above.

To obtain a perfectly sound bar two things are required. The head of a chill cast bar or the gate and riser of a sand cast one, must be kind enough to send down all the liquid metal required. On the other hand the solid mass of the metal in the bar must be kind enough to permit this reserve metal a free flow whenever and wherever a cavity threatens to form. Such double-sided kindness is a rare thing to behold in this world. Hence in all probability there will always remain some unfilled cavities in the body of a cast bar. As a rule they will concentrate near the core of the bar, but may make their informal bow in any other point. We need not see them. Frequently they are microscopic in size and they may form films long and wide enough to separate two adjacent grains efficiently, but far too thin to be observed even at medium power magnifications (say 100 to 200 times). At any rate, the core of a cast bar is always considerably lower in strength, unless the bar is produced by centrifugal casting.

Cold working the cast bar results in thoroughly reducing the extent of the cavities present in the bar. It breaks down the microscopic gas bubbles, it forces the jagged surfaces of the distorted grains one into another. Whether a real welding action takes place we know not, but just the same, the wrought bar is **usually** far superior in every respect to the cast bar from which it developed.

And since the old investigators understood well enough the influence of cold work upon the intrinsic properties of alloys, they proceeded to find the proper method of annealing—one that would yield the highest elongation possible with the least drop in strength and properties of the alloy samples so annealed were recorded as the real characteristics of the compositions studied.

So, while they started from cast bars of hardly the proper soundness, they managed, finally, to obtain a set of data and diagrams of a fairly reliable character. But this relates exclusively to the cold worked and annealed alloys.

It will not do to say that these data are entirely reliable. Just take any published set of diagrams and note how great the discrepancies are. But, pending the time when the most important alloy systems will be reexamined and reinvestigated, we must agree to consider the maximum values obtained by our forebears for the mechanical characteristics of wrought and annealed brasses as forming landmarks and goals toward the attainment of which the foundryman and the brassworker must strive.

As most reliable landmarks we indicate:

For a Zn content of	An Ultimate strength of
0%	33.000 lbs./inch
10	37.500
20	42.000
30	45.000
35	47.000
40	56.000
45	72.000

Up to 35% Zn the ultimate strength of brasses increases almost proportionately with the increase in the amount of zinc, provided the initial billets were not obviously unsound. About 400 lbs. strength per one percent of zinc is a very close estimate. Past 35% zinc the strength increases more rapidly and up to 46% zinc each additional percent of this metal produces a greater strengthening than the previous one.

The above figures represent the most valuable characteristics. The closer a given sample approaches them, the sounder it is. We purposely avoid giving the figures for the elastic limit and hardness. The first are nice, but difficult to measure. The highest elastic limit (for 35% zinc brass) is about 12.500 lbs., only one quarter of its ultimate strength. A drop of 100 lbs. may mean much and still remain unnoticed. As to hardness—it is measured only locally and tells little about the soundness of the metallic article.

The ductility of brasses, measured as the remaining elongation in the broken tensile test specimen is quite a constant figure for all properly made and annealed alloys up to 35% zinc. With a gage length of 2" it must lie between 65% and 70%. For a gage length of 4" it may drop to 60%. In fact, these figures pertain to all copper alloys wrought and annealed, as long as their structure remains analogous to that of low zinc brasses and pure copper. This applies to copper alloys with aluminum, silicon and tin, and also to carefully prepared copper-nickel alloys. We stress the point of **careful preparation,** for copper-nickel alloys are exceedingly apt to contain gases, constitutional oxides (like in plain copper) and even carbides.

This constancy (of the elongation value) does not apply so well to the ultimate strength values. If we saturate copper with tin, aluminum or silicon, i. e. bring the composition of the wrought and annealed alloy to the point beyond which the analogy of structure to that of pure copper disappears, we obtain 65,000 lbs. of strength for all these alloys. Not so with brasses. A brass with 35% zinc is technically a saturated alloy. Normal factory anneal will not homogenize a 36% zinc brass. Still the strength in this case stops at 47,000 lbs.

For alloys containing over 35% zinc the elongation drops practically in the same manner as the strength rises. It measures about 55% at 40% and 37% at 45% zinc.

With these data for the maxima of the ultimate strengths and elongations we are ready to approach properly the first part of our problem, i. e. how to make the usual brass goods strong.

We shall begin with doing away with one more fallacy, namely that cast metal **must** be weaker and less ductile than the wrought and annealed metal.

It is sufficient to say that if a given brass is cast in an open horizontal mold, designed to yield a wedge shaped bar of, say 4" height 1" width at the bottom and 3" at the top, a tensile test piece machined out of the lowest part of the bar will have a strength and elongation nearly identical to those of the wrought and annealed metal. This applies both to sand cast and chill cast bars as long as the zinc content is less than 35%. Beyond this limit we come to face certain phenomena of structural nature which cause the chill cast bars to be harder and stronger (in their lower parts) but less ductile than is proper to the wrought and annealed metal. The sand cast bars will show little or none of this deviation.

The reason for these high characteristics of the lower parts of horizontally-cast, wedge-shaped bars is to be found in the nearly complete absence of shrinkage cavities and the chance afforded the gases to escape into the upper layers. Should we take tensile bars from higher strata, their strength and ductility will be found to decrease rapidly.

Unfortunately we cannot make our castings in the same manner, i. e. by cutting away 90% of their bodies. Instead of this we use properly sized risers

for sand castings and "hot tops" for making billets. This helps a good deal. However, as stated previously, we cannot expect the risers and the body of the castings to be obliging enough to act properly, i. e. completely filling all shrinkage cavities. Still less obliging will they be as far as the release of absorbed gases is concerned. The first cause of lowered characteristics is unavoidable. The second can be reduced or eliminated by proper melting practice.

There is one case where shrinkage porosity will be automatically avoided. This is the casting of thin metallic plates in which the thickness is only a small fraction of the width and length. Here the local shrinkage effect is avoided by the natural, unimpeded shrinkage in thickness. In fact, thin plates can be cast dense without any risers.

But even such unfavorably shaped bodies like straight bars can be cast properly if the molten metal contains no gases or little of them. It is possible, for instance, to cast a single piece grid with uniform sections of ¾" thick in a 30% brass without using any risers at all and still have 40,000 lbs. strength and 50% elongation in each bar of the grid. We have no doubt that even these figures can be beaten. For suppose that the core of the casting is so bad as to possess 25,000 lbs. of strength only, against 45,000 lbs. on the outside, even then the bad, spongy part would have to occupy fully one quarter of the total section to result in the average strength of 40,000 lbs.

A separate problem is presented by changing sections and fillets in a casting. Here the main trouble is caused by a maldistribution of the heat flux. At an incoming corner the sand ought to take away twice the amount of heat conducted off from a smooth surface to cause the same speed of crystallization. But this cannot be, and therefor the diagonal of such a corner forms the last refuge for the shrinkage phenomenon. This is why the casting is weak in these points. The only remedy consists in using well rounded corners in the pattern and forgetting about the little additional cost of machining.

This article will be continued in an early issue.—Ed.

Navy and Marine Memorial

A Huge Aluminum Monument

The Navy and Marine Memorial will be dedicated on May 31, 1935. It was erected during the past summer on Columbia Island in the Potomac River near the Arlington Memorial Bridge, Washington, D. C., and will commemorate all those who have served and are serving their country in all branches of sea duty. The memorial was sculptured by Begni del Piatta and erected under the direction of Harvey Wiley Corbett, of Corbett, Harrison and MacMurray, New York, Architects. It is the largest aluminum monument in the world, with a weight of 10,000 lbs. over all, of which 8,450 lbs. is aluminum. Set on a base of sea-green granite, the casting depicts the crest of a wave just breaking, (12 feet above the pedestal), over which seven sea gulls are hovering. The wing tip of the bird is 35 ft. from the base. The monument itself is 30 ft. long and 20 ft. wide. The wing spread of the largest of the gulls is 6½ ft., while that of the smallest gull is 4½ ft. The monument was made of a number of pieces of aluminum, several by the "lost wax" process.

Inside the monument there is a metal arbor or support which has been firmly moored in concrete, giving the whole group a sturdiness which is belied by the apparent fragility of the whole conception. The various sections were caulked on the inside to provide moisture-proof joints prior to an application of an inhibitive primer and aluminum paint.

The memorial was given an anodic oxide coating at the Cleveland Foundry of the Aluminum Company of America. This coating was colored—various shades of green for the wave and the undersides of the gulls, and gold for the wing tips and the crest of the wave.

Navy and Marine Memorial, Washington, D. C.

A Brass Foundryman's Progress

By OTTO GERLINE
Gerline Brass Foundry Company, Kalamazoo, Mich.

How a Boy Grew Up to Be a Brass Foundryman. His Adventures, Joys and Sorrows, as Told to W. J. Reardon—Part 10*

DEAR BILLY:
Are you still interested in my story? Well, whether you are or not, I promised you that I would go through with it and I have never knowingly broken a promise if it was in my power to fulfill it. So here it goes.

Looking for a Job

After we had carried our little trunk around to our "own" little hall bedroom we unpacked the few clothes we had and went to bed early. This was the first time we had slept in a bed in eight days, and while the bed itself was not a Louis XIV style, it was a wonderful improvement over the deck of an Atlantic Coast Line steamer; of this I am certain.

Up bright and early next morning, we had breakfast (not hash this time) and I started out to look for a job. Mrs. Cox loaned me a dollar as she knew as well as I did that you cannot get very far around New York without car fare.

The first place of course, was the foundry of Mr. George Krouse, for whom I had worked several times before. Of the usual twelve to fourteen molders employed by him, none were working. Mr. Krouse and his brother Joe with a coremaker and a helper could fill all the orders they had, and while he promised to put me to work as soon he as could (which he did later) he could do nothing for me at that time.

This was in May, 1896, during President Cleveland's administration. For six-never-to-be-forgotten weeks, I walked and rode around New York, Brooklyn, Yonkers, Paterson, Elizabeth, Newark, and all around the section you know so well, looking for work at any thing and at any price. I had worn out my shoes as well as all my socks and the result was the same every day. No work to be had.

Billy, it is impossible for me to describe those days. My wife's folks were poor and we could not ask them to help us. Had I done so she would never have heard the last of the "I told you so's," "We warned you's" etc. To be honest, Billy, there were times when I crossed from New York or Brooklyn to Jersey City on the ferry at night when I would stand on the back end of the ferry boat and look at the wheels churning up the waters of the Hudson River in the dark and muse "Otto, old boy, you are a failure; if you just dropped off here no one would miss you and no one would care." But there was one. What would become of her? This thought and sometimes perhaps a silent prayer helped me so that I am able to write about it today. She stuck to me, encouraged me, and finally the tide turned; the panic, like all panics, came to an end. I got a job with my old friend, George Krouse.

A Job at Last

I came home one afternoon a little early, discouraged and "down in the dumps" as Andy would say, when my wife said "Otto, Mr. Krouse wants to see you at his foundry. He sent a boy up to tell you." Believe it or not, Charles Paddock could never, at his best, run three blocks to that foundry as fast as I did then. I got there in nothing flat. George told me he had a job for a few days. He took it in at actual cost to give me something to do. If George could read this, he would know that I have loved him ever since. He was good to me in many ways and I might state right here that in his foundry I learned most of my trade. He is a real Brass Foundryman and one of, if not the wealthiest jobbing Brass Foundrymen in this or any other country; and he deserves all he has. He worked hard.

By this time I owed six weeks board and room at eight dollars a week and also owed Mrs. Cox about the same amount of borrowed money.

But I made good money—anywhere from twenty-two to thirty-seven dollars per week on piece work, which was good money in those days, you know. I paid up Mrs. Cox in a hurry. I neither drank, chewed tobacco, smoked nor looked pleasant for a while, but simply worked and saved money.

And now I got another bump; not so bad, but it hurt. One day George came to me and said "Otto, you are too good a molder for this plate work. I will have to put you on loose work." That meant $2.75 per day, day work, ten hours. What could I do? I took it, and now I believe it was a good thing for me, as no doubt I would have killed myself working on the piece work job.

From that day to this I have never been broke again, altho badly bent several times.

A Home of My Own

About this time the wife and I decided to quit boarding and start housekeeping. We rented a flat for $12.00 per month, which had a stationary range and washtubs. We bought a whole outfit for bedroom and "parlor" for $120.00, paid $20.00 down and $10.00 a month with interest. I could easily have paid cash for this, but I had made up my mind that if I ever ran out of a job again, I would have some money, and they could take back the furniture. However, I didn't run out of a job, and so it was finally

*Parts 1 to 9 were published in our issues of July, 1929; November, 1929; May, 1930; August, 1930; February, 1931; September, 1931; December, 1931; July, 1932, and June, 1934.

paid for. By the way, we have several pieces of that furniture now; also some of the knives and forks; this after thirty-seven years.

About this time my wife whispered in my ear one evening "Otto, we are going to have a baby, and Oh! I do hope it will be a boy." You as a father know just exactly how I felt. I wanted the boy also; at the same time in those days, so many women gave up their lives at childbirth that I was happy one day and scared to death the next. The baby finally arrived, a twelve pound boy. The wife came through all right, and we were happy. George raised my wages to $3.00 per day as a birthday present to Otto, Jr.

This however, did not last long. Otto Kramer, a dear friend of mine and myself, both hot tempered guys, got into a fight and George had a rule which he never broke. Anyone caught fighting would be fired, and as this was a real fight and a thriller, so they told me afterwards, we both got fired. I got a job a few days after, or rather as soon as I was presentable (because we were both cut up, with both eyes closed) at the Magnus Metal Company's plant.

I then worked for the Nathan Manufacturing Company in New York for John McConnell, the man under whom I had served my apprenticeship in Erie, Pennsylvania. He was then foreman of their brass foundry.

Going to work way up at 68th Street and East River, from Jersey City, was a little too much for me, so I went back to work for George again, as also did Otto Kramer. We have never had a fight since and we are to this day the best of friends.

The Spanish-American war came on now, and George got a contract to make all the bronze castings for the thirty torpedo boats and destroyers then being built. He made the work for E. W. Bliss & Company of Brooklyn. These were busy times; we worked a good deal of overtime, as all this work had to be done in a certain length of time, and so I made some more good money. Our second child, a girl, was born about this time, and I could use the money.

Shortly after this event, little Otto took sick and in spite of two or three doctors I had taking care of him, he passed away, leaving a big empty space in my heart which has not altogether been filled since.

My wife became desperately ill and for two months I did not know whether or not she would pull through. This reduced my bank account a lot, but I was happy when she started to turn for the better.

Frenzied Foundry Practice

I must tell you a few things about the foundry business that will perhaps get a smile out of those blue Irish eyes of yours. I will not mention the names of the foundries. We made a very large condensor plate for a sugar refinery. It was about 1¼" in thickness and about seven or eight feet in diameter, with ¾" cores as close together as they could be made, still keeping a little metal between them. Copper tubes were braced into these holes and of course we had two of them to make, top and bottom. We got the mold made okay, and as we had no crane in the shop to lift the cope off and put it back on, it took nearly all the men in the shop to do this by hand. We clamped the mold with all the clamps we had, and piled all the weights and ingot metal we had in the shop on top of the cope. We poured the metal and just as the sprues and risers were filled the whole center raised up and the risers and gates went down. We had a casting an inch and a quarter thick at the edges and about two and a half or three inches thick towards the center. Of course the casting was no good. We made the next one the same way except for one change. Our foreman got a bright idea. He put a large board on top of the cope and put a 4 x 4 piece of lumber from it to one of the joists or rafters of the roof. It was an old and ragged building. When we poured our casting, the roof rose right up and we had another casting like the first one. It was here I learned how much pressure you can get on a flat casting of that size. The next mold we made, we ran two bolts through the whole mold, leaving the bolts to take the place of two cores. We laid two pieces of railway rail over the cope and bolted it down, and it came out okay; but the profit was gone.

In the same foundry we made another casting—a large bushing. We buried it partly (it was made on end and about six feet long, or deep). The casting weighed around 1800 lbs. We borrowed a ladle from an iron foundry, and also a second-hand block and fall to hoist the ladle to the sprue. We pulled our pots, poured the metal into the ladle, the boss cooled the metal to pouring temperature, and we started to hoist. We got it nearly up into position when something happened to the block. We could not move it. It would neither go up nor down, and there we were, a ton of metal hanging in the air and no place to go. Before we got our senses together to think of pouring out the metal, it had set in the ladle. And so we had a nice chunk of metal to break up to put back into the crucibles for remelting.

The boss got another idea. He had the men take this chunk of metal out into the street, and with a lot of hard work got it raised up on some fire brick and built a roaring fire around it. The street was paved with big square cut stone (what kind, I don't remember). The boss forgot to get permission from the City to use the street for a smelting, or melting place, and so the police made him put out the fire; in fact the men at the engine house nearby connected a hose to the fire plug and turned the water on it. And then things happened. It seems this particular kind of stone did not like water thrown on it when it was heated, and to show its dislike, the stones started to explode, and how! In order to wind up this thing, I will only say that by the time the man paid a fine, repaved the street, and sold the chunk of metal to a New York refining company he made but little profit on this casting. However he made it, and that spirit was perhaps responsible for his success in the business later on. If the man is still alive and reads this, he will no doubt get a good laugh out of it. I have a good laugh every time I think of it.

A Foreman's Job

The Spanish-American war was over by this time, and the country prosperous. I now made up my mind to become a real foreman. I believed I was smart enough for such a job and so I answered an ad and connected with the Kinsey & Mahler Company of Peoria, Illinois. Next time, I will tell you how I made out from then on and it may be interesting. If this stuff bores you, just let me know and I will quit writing about it. Until then, good-bye, Billy, and keep a stiff upper lip. We need it now as bad as I did during Cleveland's administration.

This series will be continued in an early issue.—Ed.

Accelerated Tests of Nickel and Chromium Plating on Steel

By PAUL W. C. STRAUSSER, ABNER BRENNER, and DR. WILLIAM BLUM[1]

An Investigation Into the Salt Spray, Intermittent Immersion and Ferroxyl Test Sponsored by the American Electro-Platers' Society.

RESEARCH PAPER RP 724. PART OF JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 13, OCTOBER 1934.

I. INTRODUCTION

IN A previous paper[2], the results of extensive exposure tests of nickel and chromium plating on steel were reported. That information is valuable in the selection and specification of the kind and thickness of plating for any given type of service. With adequate control and supervision, any given requirements for thickness can usually be met by a manufacturer or plater in his own plant. In such cases, however, it is desirable to have rapid methods of test to check the quality of the plating. Such tests are even more useful when parts are sent out to be plated, or plated parts are purchased, as then it is not usually practicable for the purchaser or user to check the time and current density employed in the plating operations.

The above exposure tests furnished a good opportunity to determine the relation between various accelerated tests and the behavior of the coatings under various atmospheric conditions. The specimens used in this investigation were a part of those plated for the exposure of tests. They will be referred to by number, with sufficient description for their identification. For details of their preparation the previous paper should be consulted.

II. ACCELERATED CORROSION TESTS

The purpose of an accelerated corrosion test is to determine, in a short time, at least the relative value of different coatings under conditions likely to be encountered in service. The latter are, however, so varied that it is practically impossible to introduce all factors into an accelerated test, much less to control their relative effects. In general, therefore, it is preferable and customary to employ a simple test such as (a) exposure to a fine spray of sodium chloride, commonly known as a salt spray test, or (b) immersion in a corrosive solution, for example, intermittent immersion in a sodium chloride solution.

The principal substances that are likely to cause or accelerate corrosion of steel in the atmosphere are oxygen, water, carbon dioxide, sulphur dioxide and trioxide, and sodium chloride. The first three substances are always present, but generally their effects are slow and not directly susceptible of great acceleration. The sulphur compounds are found in urban and industrial atmospheres, and sodium chloride is present in marine exposures.

Various efforts have been made to introduce sulphur dioxide into simulated but accelerated atmospheric tests. The results here and elsewhere have shown that low concentrations of sulphur dioxide (0.1 to 1 per cent), especially when continuously present, exert solvent effects on the coatings that are entirely unlike the effects of industrial atmospheres that contain fluctuating and much smaller concentrations of sulphur compounds. Sodium chloride has therefore been most extensively used in accelerated tests. It might be predicted, and has been approximately confirmed, that the results are at least similar to those obtained in a strictly marine exposure. The increased rate of corrosion is obtained partly by the use of high concentrations of sodium chloride and partly by the more severe conditions under which it is applied.

Another factor that can be varied to accelerate the corrosion is the temperature, which, however, should not be so high as to change the nature of the corrosion processes. As a temperature of 35° C (95° F) is often reached naturally, even in temperature climates, it was selected for use in the salt spray and intermittent immersion tests, which were carried out in a room with thermostatic control. Tests made at "room temperature" are subject to uncertainty through the fact that in uncontrolled rooms the extreme temperature at various seasons may range from 10° C (50° F) to 35° C (95° F). The latter temperature was selected because it is about the lowest that can be maintained throughout the year without artificial cooling.

Before applying any accelerated test to plated metals, the surface should be thoroughly cleaned in order to permit uniform access of the reagent to the surface. A simple test for cleanness is that the surface shall be uniformly wet with water, that is, there shall be no "water-break." The cleaning was accomplished in these tests by rubbing with cotton or cloth moistened with a thin paste of pure, fine magnesium oxide. Vapor cleaning with a suitable solvent is effective, but less convenient for laboratory testing.

1. Methods

The salt spray and intermittent immersion were applied to most of the nickel and chromium finishes under the following conditions.

(a) Salt Spray

The salt spray test was conducted with a 20 per cent solution of pure sodium chloride in a room kept at 35° C (95° F). The nozzle, air pressure, and baffle were so adjusted as to keep a uniform fine mist

[1]Mr. Strausser is Research Associate at the National Bureau of Standards for the American Electroplaters' Society; Dr. Blum is Head of the Division of Electro-chemistry.

[2]W. Blum, P. W. C. Strausser, and A. Brenner, J. Research NBS 13, 357 (1934); RP712.

throughout the box and to wet uniformly the specimens, which were placed at an angle of 45° from horizontal. The solution that was condensed from the spray was drained off and not used again. The specimens with buffed nickel and chromium coatings were painted on the edges with a bituminous paint to prevent formation of rust there, which might run over the surface.

The specimens were inspected at the end of the first 6 hours and of each 24-hour period. At each inspection, they were washed lightly with running water and a number of rust spots on each specimen was noted. In addition, a rating of from 5 to 0, on the same basis as the exposure ratings, was given to each specimen. If, at the end of a definite period such as 100 hours, the corrosion was so pronounced that rust spread over the surface, the latter was cleaned by light rubbing with magnesium oxide paste, rinsed, and returned to the salt spray for 4 hours. This served to bring out the spots clearly without much spreading of the rust.

(b) Intermittent Immersion

The intermittent immersion tests were also conducted with a 20 per cent solution of sodium chloride. Each cycle included 1 minute in the solution and 14 minutes in air. The temperature was kept at 35° C (95° F) and the relative humidity at 60 ± 5 per cent. This constant humidity insured a uniform tendency of the specimens to dry during the air exposures. Under these conditions they were visibly wet for about one-half the period in the air. The specimens were inspected at the same intervals as in the salt spray and the condition of each was similarly recorded.

2. Results

The results of the accelerated tests may best be considered by comparing them with those of the atmospheric tests. The latter data in table 1 are based on 18 months' exposure. At Key West and Sandy Hook, the corrosion was more severe than at State College and Washington, and more easily rated than at New York and Pittsburgh.

(a) Salt Spray

The results of this test are most commonly reported in terms of the period required for the initial appearance of rust. There is, however, considerable latitude in judging the amount of rust that constitutes failure in this test. Some define it as rust plainly visible at a distance of 3 feet. Others simply disregard what they consider to be very small rust areas. In this study, any rust visible to the unaided eye at a distance of 12 to 18 inches was recorded. The number of rust spots was noted at intervals, and a rating was also given according to the scale used in the atmospheric tests.

The results in table 1 show that, as defined by us, the first appearance of rust has no direct relation to the quality of the coating. For example, in (b) and (d) a slight amount of rust appeared in 6 hours on very thick deposits (nos. 16 and 116), which were known to have good protective value in the atmosphere. The individual results are even more erratic than shown in table 1, which presents the averages of 3 specimens. It was not unusual for slight rust to appear on one specimen in 6 hours and another of the same set in 50 or 100 hours.

If, however, the number of rust spots is recorded at the end of a definite period such as 100 hours, the results in the salt spray are very similar to those of the ferroxyl test to be described later. Apparently, the salt spray merely detects pores, but requires 24 to 100 hours, instead of the 5 or 10 minutes required for the ferroxyl test. In general, the ratings at the end of 100 hours correspond inversely to the number of spots at that time. It is therefore suggested that in the salt spray test greater attention be paid to the number and size of the spots after a definite interval than to the time of their initial appearance.

As the salt spray test is sometimes conducted with a dilute salt solution, and is almost always conducted without control of temperature, a few tests were made to determine the effects of concentration and temperature. The results, not recorded in table 1, may be summarized as follows:

Table 1.—Porosity and Accelerated Tests on Nickel and Chromium Finishes

Set No	Total thickness In.	18 mo. atm. ex. score KWSH %	NYP %	SCW %	Ferroxyl Test Number of spots[2]	First run Hr.	Salt spray Spots at 100 hr.[2]	Rating at 100 hr.	Corresponding score %	Intermittent immersion First rust Hr.	Spots at 100 hr.	Rating at 100 hr.	Corresponding score %
(a) NICKEL													
52	0.00025	10	13	33	100	6	80	2	40	6	40	3	60
5	.0005	25	25	76	12	12	20	3.5	70	30	4	4	80
1	.001	65	52	87	3	20	5	4	80	30	2	4	80
6	.002	79	69	95	3	70	1	4.5	90	80	2	4.5	90
(b) NICKEL, COPPER, NICKEL													
53	.00025	4	13	15	200	6	100	1	20	6	100	1	20
15	.0005	13	3	81	40	6	70	2.5	50	25	35	3.5	70
13	.001	49	47	92	2	20	15	4	80	25	8	4	80
16	.002	69	65	99	0	6	10	4	80	75	2	4.5	90
(c) NICKEL, CHROMIUM													
152	.00025	9	20	51	80	15	100	2.5	50	50	35	3.5	70
105	.0005	10	20	72	20	25	25	3.7	70	65	2	4	80
101	.001	51	46	100	2	50	10	4	80	90	1	4.5	90
106	.002	80	84	96	0	55	1	4.5	90	85	0	4.5	90
(d) NICKEL, COPPER, NICKEL, CHROMIUM													
153	.00025	10	19	42	100	15	100	2	40	40	60	3	60
115	.0005	15	26	88	8	15	60	3	60	35	25	3.5	70
113	.001	36	39	98	2	15	20	4	80	40	25	3.5	70
116	.002	79	57	100	1	6	3	4.5	90	65	15	4.5	90

[2]Per specimen on 1 side, having an area of approximately 1.5 dm^2 or 1/6 $ft.^2$

With a N solution of sodium chloride (about 5.5 per cent NaCl), the rate of failure of nickel and chromium plated steel was much slower than in a 20 per cent solution. In general at 22° C (72° F) it required about 72 hours in the dilute solution to produce the same corrosion as appeared in 24 hours in the 20 per cent solution.

The effect of temperature was more marked during the first part of the test period than during longer periods. For example at approximately 22° C (72° F) it required about 48 hours to produce the same corrosion as appeared in 24 hours at 35° C (95° F). However, at the end of 100 hours there was not much difference in the amount of rust produced at the 2 temperatures. It is apparent therefore that the customary definition of failure in terms of the time required for the first appearance of rust requires even closer control of temperature than when the extent of rust at the end of a longer period is estimated.

Any ratios based on the above tests are only approximate, and are useful merely for showing the direction and magnitudes involved, and not for making corrections for variations in temperature or concentration. Consistent results can be obtained only at a controlled temperature, for which 35° C (95° F) is the lowest practicable without artificial cooling.

(b) Intermittent Immersion

The results of the intermittent immersion are very similar to those of exposure to salt spray and are subject to the same limitations. The periods for the first appearance of rust are somewhat longer, but more consistent than in the salt spray. The number of spots developed in 100 hours is usually less than in the salt spray. There does not appear to be any marked advantage in using the intermittent immersion test instead of the salt spray test for nickel and chromium finishes.

(c) Relation to Atmospheric Exposure

When the rating or number of spots after 100 hours is noted, both the salt spray and intermittent immersion tests place the sets of each group in the order of thickness, that is, in the same order of quality as in the atmosphere. They are therefore useful in distinguishing between good and poor coatings, even though the size, color, and distribution of the rust spots are not very similar to those in even a marine atmosphere, much less in an industrial atmosphere.

These two tests do not generally serve to detect small differences in protective value, which in turn are not usually consistent in different types of exposure. However, they both showed (in tests not recorded in table 1) the superiority of nickel finishes applied over a buffed copper layer to those over unbuffed copper, which difference was also reported in the atmospheric tests. This effect was not observed when chromium was also present.

An example of misleading results in the salt spray and intermittent immersion tests is the fact that composite coatings of cadmium, copper, and nickel (set no. 25) failed very rapidly in both tests, but not in either a marine or an industrial atmosphere. When chromium was applied over the nickel (set no. 125), no marked failure of the composite coating was observed in either the accelerated or atmospheric tests.

III. POROSITY TESTS

Both the exposure tests and the accelerated tests showed clearly that the protective value on steel of coatings consisting of the more noble metals, such as copper, nickel, or chromium, depends almost entirely on their freedom from porosity, while that of less noble metals such as zinc and cadmium is approximately proportional to the minimum thickness. If it were possible to produce absolutely impervious coatings of the first group, especially of chromium, they would furnish permanent protection in most climates. Apparently the only practical method of approaching this goal is to make the deposits thicker, and even this method is not certain for chromium. Reliable tests for porosity may therefore be very useful for inspection, as they require much less time than the usual accelerated corrosion tests.

1. In Nickel Coatings

(a) On Steel

Ferroxyl test.—This well-known test is applicable for detecting pores in any metallic coating on steel that is more noble than the steel. It depends upon treating the surface with a solution containing an agent, usually sodium chloride, that will attack steel but not the coating, and a substance that will react visibly with iron compounds. A ferricyanide solution is used, as it produces blue spots with any ferrous salt formed by the action of the sodium chloride on exposed steel. The mixed reagent may be applied as an aqueous solution, or one containing a gel (such as agar) that will form a congealed film, or in paper saturated with the reagent[8]. As the latter method yields a permanent record, it was employed in this investigation.

A study of this method showed that the concentration of the sodium chloride is not critical, though stronger solutions accelerate the attack of exposed steel. The concentration of ferricyanide should, however, be kept as low as possible and still yield blue spots. In high concentrations, the ferricyanide attacks nickel appreciably, especially in the presence of sodium chloride, and may therefore produce pores where the nickel is originally thin but not porous.

The most consistent results were obtained under the following conditions. The liquid reagent contained 60 g/l of sodium chloride and 0.5 g/l of potassium ferricyanide. For making the ferroxyl paper, 10 g/l of agar was dissolved in this warm reagent, and a 50 per cent white rag bond paper was soaked in it and allowed to dry. The plated surface was cleaned by rubbing with fine magnesium oxide and water, and rinsed, after which it was immersed in the ferroxyl solution without agar for 5 minutes. The paper was then moistened, pressed on the surface, and removed after 5 minutes. The number of blue spots, excluding those within 0.25 in. of the edge, was recorded.

As shown in table 1, when the ferroxyl test is applied to coatings consisting of copper, nickel, or chromium on steel, the porosity roughly corresponds (though inversely) to the thickness of the coatings and to their percentage scores in the exposure tests. The method serves to detect marked differences in porosity, such as are commonly observed on coatings of different thicknesses, but cannot be used to predict the small differences in behavior of specimens with the same thickness but with different composition. Just as with the above-described accelerated

[8] Pitschner, K., Proc. Am. Soc. Testing Materials (II), 27, 304 (1927).

tests, it is difficult to incorporate the ferroxyl test into a specification because the value of the coating depends on the size of the pores as well as their number. The method is therefore chiefly of value for factory inspection of similar coatings and articles.

(b) On Copper

In most cases it is necessary to detect only those pores which extend through to the steel, which can usually be done with the ferroxyl test. Occasionally, however, it may be desirable to study the porosity of the separate layers, and especially of the outer nickel layer, in composite coatings that include a layer of copper.

Sometimes when the ferroxyl test is applied to composite coatings with an intermediate copper layer, red spots appear. These are caused by copper ferrocyanide, and their detection can be facilitated by adding a small amount, such as 1 g/l, of ferrocyanide to the ferroxyl reagent.

Another method that yields fair results is to immerse the specimen in hydrogen sulphide water. Black spots appear where any appreciable area of copper is exposed, but fine pores are not readily detected.

(c) On Zinc or Cadmium

It was found that by treating the surface for about 30 seconds with a solution that contained sulphuric acid (**N**, 49 g/l H_2SO_4) and copper sulphate (0.08 N, 10 g/l $CuSO_4.5H_2O$), copper deposited wherever zinc or cadmium was exposed. The presence of the copper was more readily detected by subsequently immersing the specimen in water saturated with hydrogen sulphide, which produced black spots. Any large pores or unplated areas were readily revealed, but the detection of fine pores was uncertain.

2. In Chromium

The methods for detecting pores or cracks in chromium coatings were fully described in a previous publication[4]. The copper deposition test, which depends upon the fact that copper is deposited only in pores or cracks in the chromium, was then found to be most reliable. When applied to various deposits used in this investigation, the results were consistent with those previously reported. This is important in view of the fact that some of the results of the exposure tests did not correspond with the predictions made on the basis of the porosity of the chromium coatings.

IV. CONCLUSIONS

Both the salt spray and intermittent immersion tests are useful for determining the relative quality, and especially the porosity, of coatings consisting of copper, nickel, and chromium. The results are more significant and more closely related to those of atmospheric exposure if the number and size of the rust spots at the end of a specific period, such as 100 hours, are recorded, rather than the time for the first appearance of rust. These methods do not, however, closely reproduce the types of corrosion produced in the atmosphere, and do not serve to detect small differences in protective value. The ferroxyl tests is a rapid, reliable method for determining the relative porosity of the coatings.

[4]The porosity of electroplated chromium coatings, W. Blum, W. P. Barrows, and A. Brenner, BS J. Research 7, 697 (1931); RP368.

Refining Silver Alloys

Q.—I have been doing some refining of silver alloys and have had trouble separating silver and zinc. Do you know where I might get some information regarding these metals?

A.—It should not be hard to separate silver and zinc by acid methods, as they are very different chemically. You do not tell us how the two are together; do they form an alloy, or are they simply mixed together?

If they are simply mixed together, you may be able to get rid of the zinc by treating the mixture with dilute sulphuric acid—one part acid poured into say ten parts water. This mixture acts on zinc in the cold, and does not attack the silver. Do not heat it up. Hydrochloric acid can be used instead, diluted in the proportions of say five or six parts of water to one of acid. After the acid has acted, pour it off and wash well.

But maybe your silver and zinc are alloyed or melted together. In that case you will have to dissolve the whole bar or button in nitric acid as your first step. Then precipitate the silver as silver chloride, using table salt or hydrochloric acid to precipitate it. The final step is to wash this silver chloride and then reduce it to metallic silver.

Possibly you have already tried these methods and still have trouble. If so, it may be that the zinc you are using contains some arsenic; this is often the case with cheap zinc. Arsenic in silver is sure to cause trouble, and may be the explanation in your case.

One further point: The job of remelting fine silver is not an easy one. Even if you have refined your alloy properly, and even though all the zinc be removed, it is quite possible that your remelted silver will behave badly. That is because fine silver, when hot, absorbs large volumes of air and other gases; as it cools these gases are expelled, sometimes violently, with the result that the metal spits and forms oddly shaped forms called "crabs." This means no reflection on your refining methods.—**Jewelry Metallurgist.**

Revised Standards For Brass Rods

Specifications for Free-Cutting Brass Rod for Use in Screw Machines[1] have been approved as American Standard as a revision of a previous standard approved in 1925 by The American Standards Association, 29 W. 39th St., New York.

The specifications cover methods of manufacturing, chemical and physical properties and tests, and permissible variations in diameter of free-cutting brass rods of any cross-section that are suitable for use in high-speed screw machines.

[1]H8-1934; ASTM-B16-29.

Plating Plant Layout

By A. J. LUPIEN
Udylite Company, Detroit, Mich

Scientific Procedure in Laying Out the Plating Plant for Economical Operation*

THIS subject of plating plant layout is undoubtedly so familiar to you that it needs no introduction. There is probably not one of us who, at some time or another, has not been given the responsibility of arranging his plating equipment in a manner efficient and economical.

Purpose

The purpose of this paper is **first** to enumerate the important factors generally considered when laying out a plating plant; **second,** to discuss some causes of poor layouts; and **third,** to bring out a few examples of plating departments as they were and how they have been corrected.

Technique of Plant Layout

Perhaps the best method is to draw to scale a diagram of the proposed space. This diagram should show the location of posts, windows, doors and present drains. Then all the tanks and generators should be drawn to the same scale on a separate piece of cardboard in terms of their overall widths and lengths. When this has been done these tank diagrams should be cut out and arranged on the "floor space diagram" in different ways until the most suitable layout has been found. You can readily see how much easier it is to use this method than to draw up a large number of complete sketches.

Important Factors

It is during this process of diagramatic layout that attention should be paid to the following factors:

1. **Economy of space**—not only of space taken up by the equipment, but also of that allowed for aisles, loading and unloading areas. This is very important in large modern plants where the cost per square foot of floor area is high.

2. **The smooth flow of the work**—which means laying out to fit the operations preceding those in the plating department as well as those which are to follow. The work may be entering the plating department at one end and leaving at the other, or it may be entering and leaving at the same end. The layout then should be planned to fit such local factors.

3. **Efficiency of processing**—in which is included **cost of labor** and **ease of handling.** The equipment should be arranged to eliminate long distances of travel and to cut out any unnecessary motions on the part of the men. Walking several feet more than is necessary may not mean much during the first hour of work each day, but over an eight-hour period it cannot help but slow down production. Each man should preferably work in his own space. When this is not possible the aisles should be made large enough to allow the operators to pass one another with ease even when they are carrying racks of work. Attention should be given to placing the tanks at a level where the workmen will not have to lift too high nor bend too low.

4. **Conservation of Electrical Energy and Materials**—Thought should be given to the placing of the generator so that a minimum of bus bar is used and so that the generator itself is protected as much as possible from corroding fumes. A minimum of bus bar means a minimum of joints which frequently are the sources of appreciable drops in voltage. This same thought of conservation should be carried through with regard to all materials such as exhaust systems, when needed. In this case it is customary to make the ducts as short as possible.

Frequently there will be a conflict between the requirements for efficiency of processing and conservation of materials, requiring good judgment. In general the efficiency of processing will predominate in the final compromise.

5. **Appearance**—This enters the discussion because it is so easy to build a plant which meets most requirements. By appearance, it is not meant that all tanks should be set in perfect symmetry, which is often an expensive luxury. Rather, equipment should be arranged so that a minimum of solutions are spilled on the floor. This is not only a question of appearance, but also one of efficiency of process—because wet floors are slippery and men do not get over them as easily as over clean, dry floors.

Revamping Existing Layouts

However, as stated before, plating departments are for the most part inherited. The plater gets them after they have been in operation for years and have had so many pieces of equipment added to them from time to time that no one can follow a procedure of operations that will save time and money or eliminate waste. When changes become necessary a thorough study should be made to determine the best methods of meeting the new requirements. It is often surprising how much costs can be cut by revamping the layout. Each job of any volume requires a layout of its own, and the sooner we learn to consider changes in layout to fit a particular job, the sooner costs will be cut to a minimum.

Typical Conditions Necessitating Layout Changes

Perhaps there is no better way to explain what is meant by revision of plant layout than to relate some typical conditions encountered in several plants during service calls.

*Read at Detroit 1934 Convention of the American Electro-Platers' Society. From the Monthly Review, January, 1935.

In the first instance, the cause of the trouble was that the layout no longer fitted the job. The installation had been originally put in to handle automobile hub caps. Provision had been made to take care of future increase in production, but when business picked up to the point where these figures were reached, the hub caps themselves had larger circumferences, deeper recesses and, consequently, more surface. The plating plant layout would have been just right if the job itself had not changed.

Now, in this particular plant the haphazard addition of the necessary tanks to handle this new type of hub cap would have entailed a greater unit cost of production. This was so because the new tanks would have to be placed in the plating room in locations which would require more labor and more walking to the plating tank and from it, more solutions dripping on the floor, and a criss-crossing of the various operators.

Consequently, the tanks could not be operated at full capacity. Too much time would be lost just running around. Against this condition the plater could revamp the layout, insert at the proper spot a new and larger tank in place of the old one, or another additional tank to care for the increased production. He figured out how long it would be necessary to shut down in order to make the change, and how much this shut-down would cost his company. He also figured out how much the additional equipment would cost.

It was obvious that the initial cost of just adding another tank, anywhere in the plating room, would be lower. It was impossible to figure out where the increased cost of production would lead because this increased cost in so competitive a field, might result in the loss of the job. The plater favored a revamping of the layout, and backed up his judgment with such sound argument that he was allowed to go ahead. Since then it has been learned that it would have cost the company over four times as much to operate the department without revamping—and, an official adds, "there would be no end in sight yet."

The second instance involves a company in whose plating department a high percentage of rejects had suddenly developed. At first there was apparently no reason for this condition—the men were old employees, the work had not varied, the solutions were in good shape and the layout had not been changed. However, the reason for this condition was soon brought to light.

About a week before the service call, a new system of "group payment" had been put into effect. While the operators were being paid on an hourly basis, the inefficiencies of the layout did not become apparent; time lost between tank loads was taken as a matter of course. With the change in the system, however, the operators needed every available minute to benefit their own pay envelopes. This resulted in their trying to speed up operations by reducing the plating time and the cleaning time, with the consequent non-uniformity of cleaning and plate coverage, not to mention the variations in thickness of plate on the various rack loads.

In the presence of the foreman plater the operators followed specifications, but he could not be watching his men all of the time. Nor could he lay the blame to any one man because the layout was such that each operator had a hand in each operation. The layout was changed to suit the new condition; the equipment was replanned so there would be no loss of time, and so that each operator was made responsible only for a limited number of operations. This eliminated the trouble.

Sketches of Layouts

Typical layouts shown in the illustrations, demonstrate the points just brought out. In the first system, each of the two men operators takes work from the racking bench after it has been racked. Let us follow the men through the various plating operations:

Operator No. 1 Operation		Operator No. 2 Operation	
#1	Clean in tank #2	#1	Clean in tank #2
#2	Rinse in tank #10	#2	Rinse in tank #8
#3	Pickle in tank #3	#3	Pickle in tank #3
#4	Rinse in tank #10	#4	Rinse in tank #8
#5	Dip in crock #6	#5	Dip in crock #6
#6	Rinse in tank #9	#6	Rinse in tank #9
#7	Rinse in tank #11	#7	Rinse in tank #7
#8	Plate in tank #5	#8	Plate in tank #4
#9	Rinse in tank #12	#9	Rinse in tank #12
#10	Rinse in tank #13	#10	Rinse in tank #13
#11	Dry in tank #14	#11	Dry in tank #14

From operation 1 to 8 inclusive there is a lot of unnecessary retracing of footsteps (See Figure 1). This

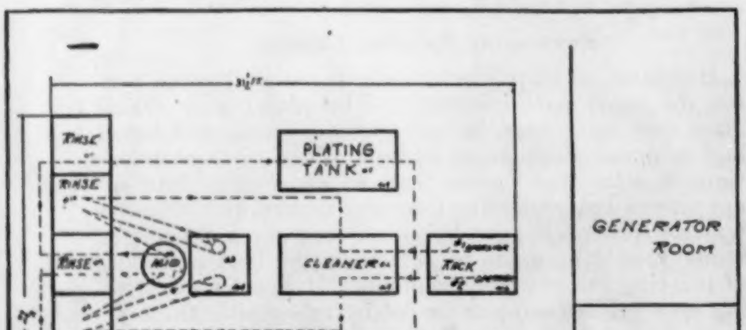


Fig. 1. Faulty Layout Resulting in Extra Steps

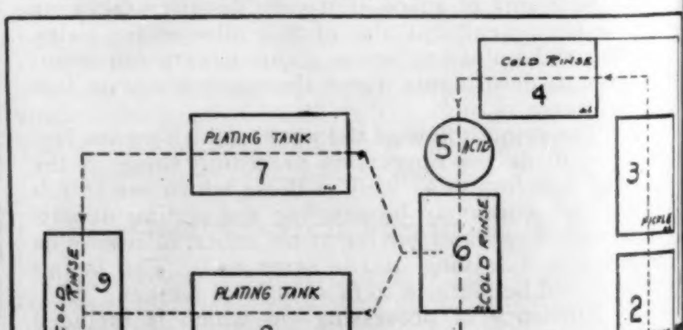


Fig. 2. Good Layout With Minimum Steps

causes a lot of time which the operator tries to make up by reducing the plating and cleaning periods.

The above conditions could be overcome by changing the layout so that the proper tanks would follow one another in a direct line, just as is done in a full-automatic plating machine. Figure 2 gives a clear picture of this.

In this set-up each of the two operators has his work definitely cut out for him. Operator # 1 takes the work from the racking bench and, after moving it successively through tanks 1, 2, 3, 4, 5 and 6, finds himself back at the racking bench ready to repeat the cycle. There is no lost motion, no unnecessary floor-walking with racks dripping with several different kinds of solution. Operator #2 starts his cycle at tank 6. From here he, too, goes in a complete circle to tank or 8, as the case may be, and thence on to tanks 9, 10 and 11. At tank 11 he is well on his way to tank 6 ready to repeat the operations.

The work itself starts and stops at the racking bench where operator can do both the racking and the drying operations.

Another advantage in this set-up is that any parts rejected because of cleaning can be brought to the attention of Operator 1, while parts rejected because of poor plating can be changed to Operator 2. The observance of orders, regarding the time of cleaning and the time of plating, is almost certainly assured with this arrangement, thus eliminating much less supervision.

Time Study

There are instances when a time study diagram will readily show how a layout can be replanned to increase production. The operations in a plating department where the plater lifted his load in and out of the tanks with an electric hoist were studied, and a diagram made chartering their relationship.

In this plant all the tanks were arranged side by side in a straight line, with their ends abutting on an aisle from which the plater manipulated this hoist. The system was such that work was being loaded onto the cathode rods, which were then transferred from tank to tank until they reached the unloading space. All tanks except the plating tank were capable of taking only one cathode rod assembly at a time. The plating tank could take two assemblies. However, it was noted that the plating tank was being used to only half of its capacity most of the time, and that not much more than half of the production expected was being turned out.

We made a study of the sequence of operations, the minimum time necessary for cleaning, and of the time necessary for making the transfers. The diagram time study shown in Diagram # 1 pictures what was happening. The heavy, horizontal lines designate the periods of rest in the cleaner, the acid and the plating tanks. The light vertical lines designate the periods of travel of man and hoist.

Let us follow the plater on the diagram beginning at the time his first load is ready to come out of the cleaner tank. He picks up the load, rinses it in water, and after transferring to the acid tank, where he lets it rest, he moves down to the loading area for another load. The new load having been picked up and been placed in the cleaner tank, he goes back to the acid tank where he picks up the first load, rinses in water, and places it in the plating tank. After he had done this he must wait for his second load to be cleaned before he can continue his operations—this leaves one-half of the plating tank empty. During this waiting period the plater can help in the loading of another rack, but the process of plating is not benefitted in any way.

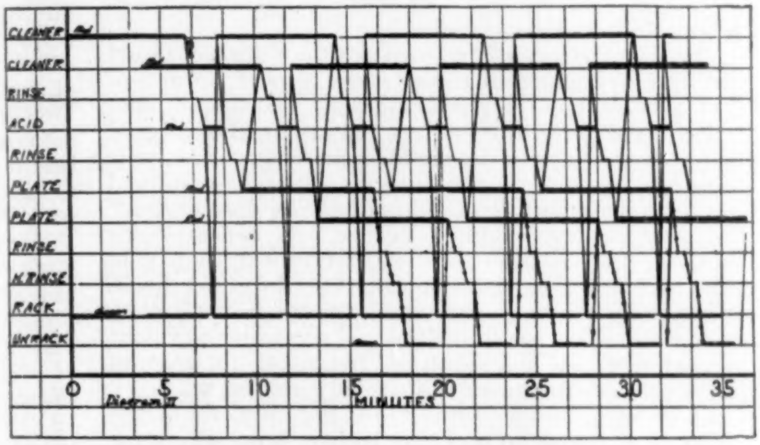


Diagram 2. Time Study of Good Layout

The diagram shows that the cleaner tank is the "neck in the bottle." If we were to double the size of the cleaner tank, would we then solve the problem? The second diagram, Diagram # 2 in which the heavy and light lines have the same meaning as in the first diagram, shows that it would not. For in this case the plating tank would become the "neck of the bottle." From this second diagram it is found that another hoist is necessary, as designated by the dotted lines. Also, this hoist can be handled by the man who does the unloading, and the two hoists can be operated on the same track without any interference whatever. It is also shown here that cleaning, pickling and plating periods would be uniform—all loads being treated alike.

Time study diagrams at first may seem complicated. However, if you make up your mind to use them, you will find they give you a clear picture of what is happening in your plating rooms. They are not difficult to make, and will save a great deal of time.

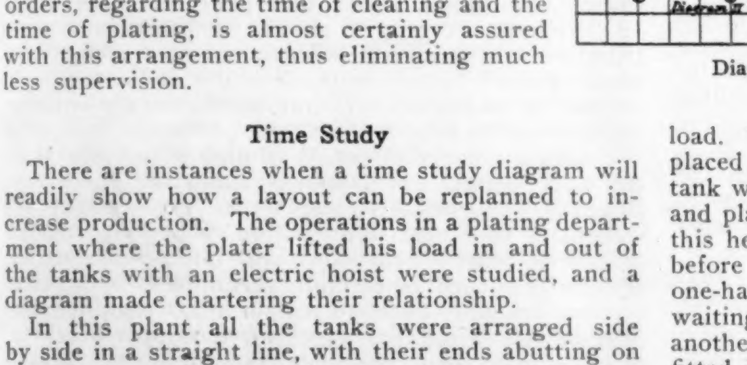


Diagram 1. Time Study of Faulty Layout

EDITORIALS

Gold Clause Upheld

THE long awaited decision of the Supreme Court of the United States on the validity of the Government's procedure in the matter of gold payments was delivered on Monday, February 18th. Business had been at a standstill for weeks, not knowing whether the decision might overturn the present status of Government finances and also private corporations with gold bonds outstanding.

The judgment of the majority of the Supreme Court (five to four) upheld in almost every respect, the acts of the Government—but not its morals. The Government is permitted to pay the interest and principal of its gold bonds in the present depreciated currency. The same privilege is given to corporations. The Government was, of course, within its rights in taking the dollar off the gold standard, but Congress was censured for breaking the contract of the Government to pay in gold in full for its gold bonds. On the other hand, bondholders are not permitted to sue because they cannot show any sustained loss in accepting payment in currency; on the contrary, payment in gold in full would constitute an unjustified enrichment.

As usual in cases of this kind, the opinions of the public are mixed. On some points, however, there seems to be unanimity. The Government has for practical purposes "won" this case. It is permitted to pay for its bonds in depreciated currency, since the bondholders suffer no visible loss thereby. It is relieved of the possible loss of untold billions of dollars, which it would have incurred if it had had to pay in gold in full. Very likely this has saved us from a financial crisis, and it is not impossible that the decision of the Court may have been influenced by that consideration. On the other hand, the Government was criticized for repudiating its solemn contracts. But at the same time holders of these broken contracts were not allowed any recourse.

The differences of opinion lie in the estimates of the effect of this decision on our national future. One of the minority opinions of the Court dissents in no uncertain terms, stating that the Constitution is gone, and expresses shame and humiliation at the repudiation of national obligations. Leading commentators like Col. Ayres and Frank A. Vanderlip believe that the results will be advantageous in removing doubts and fears which had oppressed business, and perhaps avoiding financial chaos.

Actual effect upon business has been slight as we had already adjusted ourselves to the changed dollar. However, we are freed from uncertainty and also from the necessity of revising again the financial structure of the Nation. One large near-by obstacle has been removed from the path of business improvement.

The Future of The NRA

THE National Recovery Administration started about a year and a half ago with high hopes. It is unnecessary to trace its history in detail as it is too well known to need repetition. Suffice to say, it did not succeed.

On the other hand it would be unfair to say that the NRA has failed. It was something so new in character, so untried, so radically different in its purposes (the Clayton and Sherman Acts had to be set aside to allow it to operate) that it could not possibly have succeeded overnight. Undoubtedly it has bogged down. The methods by which it began (and perhaps had to begin)—high pressure and threats—have proved unsuccessful.

New methods and plans are to be developed if the reports in the daily press from Washington mean anything at all. It has been intimated that production control and price-fixing will be eliminated from almost all of the codes. There may be other far-reaching changes. The Supreme Court will probably rule soon on the constitutionality of having codes written by industry, and with the approval of the Administration become the "Law of the Land." Will Presidential Orders continue to have the full force of acts of Congress? We do not know.

As yet we have only opinions. S. Clay Williams, chairman of the National Industrial Recovery Board, urges the extension of the NRA, substantially in its present form, for another year or two in order that we may gain experience. J. Harvey Williams, president of the American Supply and Machinery Manufacturers Association, states that price stabilization is an absolute necessity if small producers and distributors are to remain independent of a recognized trend toward larger units in many industries. A number of manufacturers' organizations are equally insistent on the necessity for price control.

Unofficial reports from Washington indicate that the task before the National Industrial Recovery Board is unbelievably huge, that enforcement of reasonable code provisions will be pushed vigorously, that price-control provisions will not be eliminated arbitrarily but will be carefully scrutinized. Open price systems are more likely to remain intact than definite price-fixing. Minimum wages for the upper brackets of labor may also come under consideration. Maximum hours and child labor prohibition are sure to be retained no matter what happens to the NRA. There will probably be no mandatory 30-hour week but there may be pressure toward a 36-hour week. The knottiest problem before the Board at this time is the situation in the small industries.

We must keep in sight the indisputable fact that under the NRA, manufacturers have for the first time been allowed legally to sit down and openly discuss their troubles with their competitors and to co-operate with each other in eliminating them. The price to be paid for this freedom is high perhaps, but it seems to be the general opinion that such freedom cannot be purchased cheaply and that it is worth any reasonable cost. It is for that reason, undoubtedly, that so many manufacturers in so many lines and so many trade associations have asked for the extension of the Recovery Act.

That changes must be made is certain; the NRA is not functioning satisfactorily. But it is fairly generally agreed that some such organization is necessary. It is altogether because of this demand that a permanent NRA may be enacted by Congress eventually, although there is also the possibility that our present Congress may extend the "emergency" to allow more time for study. Government supervision will, of course, be a part of any of the arrangements.

Die Casting Progress

ONE of the most interesting industries of our period is the manufacture of die castings. It is young in comparison to most of our standard processes, but it is prominent among the leaders in the matter of technical improvement.

The term die casting which means literally casting in dies, theoretically covers a wide range. Practically, in the United States, however, it has been confined to the production of metal parts, in metal molds, or dies, cast under pressure. A comprehensive, though brief, summary of the industry is given by Sam Tour in a recent issue of Mining and Metallurgy.

It is interesting that the progress of die casting has been accompanied by, or perhaps even brought about, progress in its allied industries. For example, one of the problems of die casting has always been a suitable material for dies which would withstand high temperatures and high pressures, and also the rapid fluctuations, in temperature and pressure, inevitable to the process. Only intensive study could have achieved the high grade alloy steels now available, such as chrome vanadium with 2 per cent chromium; chrome tungsten with 5 per cent chromium and tungsten; chromium molybdenum with 5 per cent chromium and 1.5 per cent molybdenum and so on. Moreover, methods of heat treating had to be developed for these dies to avoid warping and cracking due to their intricate shapes. Pyrometers have been called upon to help.

We are all familiar, of course, with the outstanding improvement in the alloys used in the castings. It is now known that only zinc of the highest purity can be used safely to give castings which are free from disintegration. As a result, spectrographic analysis has been called in. The susceptibility of die castings to blow holes under the surface has created a demand for x-ray examinations. The surface peculiarities of zinc-aluminum alloys have forced the electroplating industry to greater efforts in order to develop methods for effectively plating and finishing die castings.

The latest, and far from the least important, step has been the die casting of copper base alloys, which has been solved by the use of unusual ingenuity. Steels could not be found to withstand the high melting temperatures without rapidly checking and cracking. As a result, brasses are cast not at the molten metal temperatures but at the plastic temperatures under extraordinarily high pressures. The liquid metal is allowed to become plastic after pouring into a cold chamber, and then under very high pressure, forced into the die. The process seems to lie half way between extrusion and forging.

Die casting still has a great future before it. The industry is young, and what is more important, it is very much alive.

Tin and Civilization

TIN is again coming into the spotlight. The market is fluctuating. The metal is under investigation in Congress and the perennial discussion on America's situation with respect to tin is reviving.

The absolute necessity of tin in modern civilization was pointed out in an interesting talk by D. J. Macnaughtan at the recent meeting of the Institute of Metals Division (see page 84 of this issue). Tin is a modest but indispensable assistant in the development and transmission of power. It is still the most suitable bearing material, and without bearings there can be no practical, economical functioning of mechanical power installations. Tin is indispensable as a joining material, alloyed with lead to make solder. It would be hard to visualize manufacturing without solder. Tin is absolutely necessary in the storage of food. We could not have canned foods without the non-toxic tin lining in the cans. Tin is important in the transmission of knowledge. We could not have widespread literature without printing and we could not have printing without type metal, in which tin is the most important constituent. It is clear that tin, one of our earliest known metals, dating back to the Bronze Age, is still among the leaders in our present day.

The United States consumes about half of the tin produced all over the world. The United States produces practically no tin. We are wholly dependent upon foreign countries for our supply. This is a matter of real concern to the Government, of course, primarily from the fear of possible stoppage of supplies in case of war, which would seriously hamper, if not actually cripple, production of munitions. As prominent an authority as B. M. Baruch, who was chairman of the War Industries Board during the war, recommended that the United States purchase and store thousands of tons of the metal, investing in tin just as we invest in battleships.

What is the answer? Is there a way of assuring the continuity of supplies from our nearest source, Bolivia? This might serve, even though Straits tin is still the standard in quality. Is it possible to develop a substitute or substitutes? Undoubtedly efforts will continue, and may some day achieve widespread commercial success. Probably no one material will be found to replace it in all of its manifold uses, but it may be that eventually a variety of products will be available which will give us a form of insurance against being left helpless.

A Call to Manufacturers

THE Annual Convention of the American Electroplaters' Society for 1935 will be held in Bridgeport, Conn., June 10-13. The place and time are auspicious for a convention of this kind. Connecticut will celebrate her tercentenary during this year, and Bridgeport has sometimes been called the general industrial capital of Connecticut. The slogan of the convention is "How It Is Done", which is eminently fitting for both electroplaters and Connecticut.

One of the special features will be an unusually elaborate exhibition of electroplating equipment and supplies, and also electroplated products. Special efforts are being made to make this exhibition the largest and best ever held in the history of the Society, and the results to date seem to show that these efforts will be successful. We strongly urge manufacturers to take advantage of this opportunity by taking space and showing their products.

One of the noteworthy developments in recent years in the Electroplaters' Society is the fact that not only platers attend the convention, but also chemists and engineers from all of the large and progressive concerns. It has become customary for manufacturers to send their key men, pay their expenses and receive reports of the papers and exhibits. This type of investment pays. The papers read are of the highest grade, written by leading authorities in their specialties, showing the latest advances in electroplating. The plant visits afford an opportunity for seeing "how it is done." And it is an old story that Connecticut knows how; electroplating in Connecticut dates back to 1847.

Now is the time to begin to make plans for the convention. It should not be missed.

Correspondence and Discussion

Reminiscences of a Plater's Kid

To the Editor of **Metal Industry:**

The "Reminiscences of a Plater's Kid" by Ralph W. Tillotson makes good reading. It is to be regretted that more reminiscences have not been published. Those who could tell interesting stories are all too rapidly enrolling with St. Peter to refinish the Golden Streets.

We still have with us, however, many who should follow the example set by Ralph. How about Hedley—our poet laureate—Richards; and, Bill Stratton, whose father was plater at Bradley & Hubbard's about the time of the Civil War. There must be others who can tell how they did better work than is done today and never heard of pitting until these scientific guys had to find a use for hydrogen peroxide in the plating room; tell about plating with no ammeter or voltmeter, just a galvanometer whose needle so often was found on the left side indicating that the new fangled generator that had replaced the dependable (?) batteries had reversed. Unless Ralph has heard the operatic notes oiled by squirts of Jolly Black Tar from the plater who found that his generator had reversed and that not only was his labor rendered void but, so often, the work ruined, he never heard real "rueful or profane remarks."

How lonely Wahl's "Galvanoplastic Manipulations," 1883, must be on Ralph's book shelf! Should he ever feel that it should be sent to an Old Books Home where it can enjoy the company of its fathers and grandfathers it will receive a welcome in my library which also has books that money cannot buy. Here is some of the company offered Wahl:

Elements of Metallurgy—Alfred Smee, 1851.

Manual of Electrometallurgy—James Napier, 1853.

Manipulation Hydroplastiques Guide Practique Doreur, De L'Argenteur et du Galvanoplaste—Alfred Roseleur, 1855. This is autographed by the author. Try to buy it!

Then if Wahl cannot read French there is a translation of this book by A. A. Fesquet, 1872. To overlook these children is Alliages Metalliques—A. Heve, 1839.

Ralph, just put a codicil in your will about Wahl!

Matawan, N. J.

George B. Hogaboom
Electroplating Engineer.

Electro-Zinc Coating

To the Editor of **Metal Industry:**

With reference to the statement contained in the review of Metal Plating and Finishing by Dr. A. K. Graham in the January issue, pertaining to progress in electrogalvanizing, I wish to correct the erroneous impression that this statement may create in the minds of your readers.

The reported progress relates to the application of thick zinc coatings on steel wire, i. e. heavier than obtainable with hot galvanizing. Such coatings must have a strong adherence to the base, be ductile and not impair the physical properties of the base metal. It is true that the older electrogalvanizing methods known in this country were not capable of meeting these conditions. However, such coatings, equal in every respect to those obtained by the process cited by your correspondent, were produced by an improved method of the Langbein-Pfanhauser Works of Leipzig, Germany, some time before the methods mentioned were developed.

The Langbein-Pfanhauser Works, as many of your readers probably know, have been identified with wire galvanizing from its earliest beginnings. There are many wire electrogalvanizing plants on the European continent, the great majority of which were installed by the Langbein-Pfanhauser Works. Nor is it necessary to employ special alloyed anodes in order to meet the challenge of the other new process, as one might infer from your correspondent's statement. The crux of the problem is not so much the deposition of the zinc, as the proper preparation of the base metal prior to its receiving the zinc coating.

Jersey City, N. J.

A. Weisselberg
Technical Representative in U. S. A. for the Langbein-Pfanhauser Works.

I have read Mr. Weisselberg's letter relating to the review written by me in the January issue of the **Metal Industry** with considerable interest. I must correct the impression that my statement referred to the application of unusually thick zinc coatings on steel wire other than those specified for any steel wire or strip by the A.S.T.M. Such products must meet certain specified tests for thickness and protective value. The progress reported relates to "the electrowinning of zinc from its ores by applying it directly to steel at high current density" to meet such specifications. It further refers to producing a coating of equivalent value at a cost that can compete by plating from acid zinc baths at high current densities. The aluminum mercury zinc anode has been used in such an application in preference to other zinc anodes because of its superior performance, such as freedom from sludging, improved solution control and a superior deposit. Published data in the literature also substantiate these claims. On the other hand, I can agree with Mr. Weisselberg that the base metal surface must be properly prepared prior to galvanizing.

Philadelphia, Pa.

A. Kenneth Graham
Consulting Electrochemist.

Technical Publications

Proposed Specifications for Lead-Coated Copper Sheets. American Society for Testing Materials. Bulletin for January, 1935; obtainable from the Society at 260 S. Broad Street, Philadelphia, Pa.

Economic Selection of Metal Parts in Product Design, by Louis H. Morin, 267 Fifth Avenue, New Yrok. Product Engineering, October 1934.

A Rapid Test of Thickness of Tin Coatings on Steel. The International Tin Research & Development Council has issued as Technical Publication, Series A, No. 12 a reprint of a paper by Dr. S. G. Clarke, published in "The Analyst", which describes a new rapid method of determining the thickness of a tin coating on steel. The procedure is simple; the tin is dissolved from a known area by a cold solution of hydrochloric acid and antimony chloride, and its amount is determined by the loss of weight of the specimen. The basis metal is unattacked, but a small correction has to be applied to allow for the layer of tin-iron alloy. In addition to brevity, the method has the advantage that the thickness of tin on a given portion of the surface can be determined by protecting the remainder with a coating of cellulose varnish.

Copies of this paper may be obtained from the International Tin Research & Development Council, L. J. Tavener, U. S. Representative, 149 Broadway, New York City.

Effect of Melting Conditions on the Running Quality of Aluminum Cast in Sand Molds. By A. I. Krynitsky and C. M. Saeger, Jr. Research Paper RP727. Part of Journal of Research of the National Bureau of Standards, Volume 13, October, 1934.

The effect of maximum heating temperature on the running quality of liquid metal has been studied for 2 grades of aluminum and an aluminum—8 per cent copper alloy. The running quality was measured in terms of the length of a spiral casting obtained by pouring the metal under carefully controlled conditions.

It was found that the relation between length of the spiral and the pouring temperature is linear. The running quality of the metal which has been heated to a maximum temperature of 850° C was in all cases less than when the metal had been heated to 750° C. Pure aluminum (99.8 per cent) was found to have markedly higher running qualities than the commercial (99.2 per cent) aluminum. The running quality of the aluminum—8 per cent copper alloy—was not much different from that of commercial aluminum.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical Electroplating, Polishing, and Metal Finishing

H. M. ST. JOHN	W. J. PETTIS	O. J. SIZELOVE
W. J. REARDON	W. B. FRANCIS	WALTER FRAINE

Black on Cadmium

Q.—We have been trying to obtain a satisfactory finish for black cadmium or a cadmium with a black which can be easily applied; to date, we have not been able to find just what we want.

The finish we are looking for must be an absolute black which is not applied as a lacquer or paint. Also, it must not smut off.

A.—A chemical black finish upon cadmium with which we are familiar with is made by dissolving 4 ozs. of caustic soda and 2 ozs. of antimony oxide in a gallon of water and used hot.

The black produced is soft and if left in the dip too long will become smutty. The application of a coat of clear lacquer preserves the finish. O. J. S., Problem 5,363.

Black on Silver

Q.—We are sending a sample of plate showing a blue black oxidation. This particular oxidation of course is a black oxide of silver produced by sulphur.

However, we know that some manufacturers are using a black deposit which gives identically the same color from an electrodeposited bath which doesn't eat into the pores of the silver or whatever it might be on the base metal. At the same time this deposit is very soft and very easily removed in the scratch brushing operation. One manufacturer has been using this deposit for quite a number of years on brass, copper and silver, to produce antique finishes. Can you give us a formula which will do this work?

A.—The following formula for a solution can be used to produce a black upon silver plate work which relieves very easily. However, the color is a black and not a blue black as is produced by the sulfur method and which is shown on the sample sent.

Double nickel salts	8 ozs.
Sodium sulphocyanide	2 ozs.
Zinc sulfate	1 oz.
Copper cyanide	½ oz.
Sodium cyanide	1 oz.
Ammonia	1/10 oz.
Water	1 gallon

The copper cyanide and the sodium cyanide are dissolved separately and added to the solution after the other constituents have been added. Operate solution at room temperature, and if black is too hard to relieve, add more ammonia.

O. J. S., Problem 5,364.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date............................

Name and address: ....**Employed by:** ....
Kind of solution: ....**Volume used:** ....
Tank length: ....**width:** ....**Solution depth:** ....
Anode surface, sq. ft.:...**Cathode surface, sq. ft:** ....
Distance between anode and cathode: ....**Kind of anodes:** ....
Class of work being plated: ....**Original formula of solution:**.............................
REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. ________________________________

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NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY. 116 John Street, New York City.

Bronze Bushings

Q.—We are wondering if you have any information regarding casting bronze bushings made from 80-10-10% metal varying in size from 2" to 5" in diameter and 12" long solid in steel or iron molds.

Or, if you have any information casting bronze bushings of the same metal, but with cores varying from 1" to 2" in diameter and 12" long.

There are a number of people casting bronze in cast iron molds without cores. There is no particular difficulty in casting 80-10-10 bronze in solid bar. The mold is made of cast iron and cast solid; that is, the mold is not split. The molds are finished inside with a slight taper, open at both ends and set in a suitable cup that fits the outside of the mold and prevents the metal from running out. A pouring cup is placed on the mold, and poured right straight in. The mold is made longer than the desired length so as to allow excess metal feeding that is cut off for shrinkage.

There are a number of preparations on the market to spray on the mold to prevent the metal from attacking the iron. Acetylene gas smoke is also good.

Where cores are used, trouble has been found with shrinkage. The metal chills on the outside that is next to the chill and stays open next to the core as the core seems to hold the heat and often causes shrinkage next to the core.

However, there is a method that is said to give good results. Place a pattern in an iron tube, leaving about 1½" clearance all around and ram with core sand, preferably on a jarring machine. When the mold or core is rammed the pattern is drawn out by a roll-over machine, and the core dried and washed with silica flour. And when the mold is dry, suitable cores are placed in it according to the size desired, (removable core prints are made to hold the core), and the pouring is done in the same manner as the all-iron mold. The casing or the iron mold is made from light tubing. When the proper rigging is installed, it is said that this method gives excellent results.

Another method is centrifugal casting, but that is another story. W. J. R., Problem 5,365.

Burnishing Nickel

Q.—It will be appreciated if you would advise what headway has been made in the substitution of burnishing nickel plating on steel for color buffing before chrome plating. We have been able to accomplish this in experimenting but not commercially. In handling large quantities of small parts from the burnisher, it is necessary to dry them off, since we rack for chrome plating and a large burnishing quantity cannot be instantly handled before oxidation takes place, if left out.

Also, handling in large quantities commercially we find a film or oxide of some chemical type formed on the burnished surface in the drying process, which surface film the chrome solution will not penetrate. You doubtless have run into this before and can possibly tell us what type of rinse to use before entering the rack of work in chrome solution.

A.—Deposits of nickel whether colored on a wheel or steel ball burnished, if left too long before chrome plating, will cause poor throwing power in the chrome plating operation.

Deposits of this kind, after racking for chrome plating, are cleaned in an alkaline cleaning solution, rinsed in water, and then dipped in a 20% solution of muriatic acid and water for a few seconds, rinsed in clean cold water, and chrome plated.

This procedure removes any oxides or other material that may be on the surface of the nickel deposit and better throwing power of the chromium solution is obtained.

O. J. S, Problem 5,366.

Copper-Tin, 50-50

Q.—We have recently received what we consider a very excellent alloy for aluminum solder. This alloy requires a 50-50 copper tin addition.

We would appreciate very much information as to the best method of melting a 50-50 copper tin alloy.

A.—We would suggest, to melt 50% copper and 50% tin, that you melt the copper first in a crucible. Cover the copper with silica sand and add the tin in small amounts and stir with a carbon stirring rod after each amount of tin is added. It is necessary to stir thoroughly and pour into ingots. The alloy will be brittle and will break easily, but as you are using it only to add to an aluminum solder, this should be satisfactory. W. J. R., Problem 5,367.

Cost of Plating

Q.—We would like to know the amount of deposit of nickel on some flat parts 33" sq. each. There are 80 of these pieces in a 350-gallon nickel tank of standard solution receiving 2½ volts and 150 amperes. The pieces are 6¼" x 2¼" flat stock.

Have you any method by which you determine the actual cost per piece of the deposit, taking into consideration the amount of chemicals and the upkeep of these chemicals?

A.—We have no method whereby you can obtain the actual cost of plating your work. It would require considerable study over a period of time to determine the cost.

The thickness of the nickel deposit can be determined by using a micrometer for measuring. Theoretically, it can be determined by the current density being used. From the information given of the current density used it will require approximately 2½ hours to deposit .001 of an inch.

O. J. S., Problem 5,368.

Old Chromic Acid

Q.—I have about 150 gallons chromic acid in three barrels of metal for about 2½ years, without using it. What is your opinion about this acid? Do you think it is in good condition for given chromium plate, or is it of no use?

A.—If the solution was in good operating condition when stored away, the result of having it in iron containers should not cause any great harm.

It will probably require some electrolyzing before best results will be obtained. This can be accomplished by hanging some old racks on the cathode rod and operating with high current density for several hours.

O. J. S., Problem 5,369.

Send a Sample

Q.—Under your shop problem department, or if possible by letter, will you kindly advise the method used in obtaining the oxidized finish used on radio escutcheons.

We should also appreciate the oxidizing medium used to apply the black.

A.—There are several different finishes used on the class of work you mention and it is impossible for us to give you any information regarding the method used to produce the finish unless you send us a sample of the finish desired.

O. J. S., Problem 5,370.

Silver Analysis

Q.—What is the analysis of the silver solution which we are sending you?

A.—Analysis of silver solution:

Metallic silver	.67 oz.
Free cyanide	.70 oz.

Both the metal content and the free cyanide content are too low. Add to each gallon of solution 3 ozs. of silver cyanide and 6 ozs. of sodium cyanide.

O. J. S., Problem 5,371.

Silver on Vases

Q.—How was this silver deposit put on the small vase which we are sending as a sample?

A.—The silver deposit on the vase is what is known as silver deposit work. The china from which the vase is made is painted with a silver flux, then heated in an oven until the flux is cemented to the china after which a depost of silver is applied, and then scratched brushed.

O. J. S., Problem 5,372.

Equipment

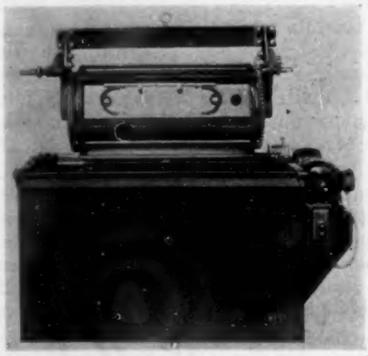
New and Useful Devices, Metals, Machinery and Supplies

The Udylite Plating Barrel

The Udylite Company, Detroit, has just developed a plating barrel for alkaline plating solutions which is said to be outstanding because of its strength, durability and efficiency.

Strength has been built into this barrel. It is constructed of the strongest possible combination of materials—steel and a special shock-resistant rubber. The cylinder consists of a framework of steel into which are fitted rubber rails and heads. The entire steel framework is anodically charged and does not plate.

The durability and efficiency of plating barrels are dependent on the insulation. Proper, efficient insulation eliminates treeing which is the principal cause of barrel destruction.



The Udylite Barrel

In the Udylite barrel it is claimed that there is no treeing. All of the current goes directly to the work because of the following reasons:

1—Every part of steel framework is exposed and anodically charged.

2—Cathode lead is encased in continuous, unbroken insulation from contact pins to dangler arbor (no slip joints).

3—Cast iron hanger from which cylinder is suspended, is not integral with or a part of the cathode lead. Consequently, strains in the hanger have no effect on the lead and do not cause its covering to crack. Such cracks in the insulation would cause treeing.

4—Bearing on which the cylinder revolves is anodic and separate from the cathode lead. Therefore, there are no slip-joints to tree and freeze causing the motor to burn out. There are no trees to destroy the cylinder material.

5—Rails are of solid rubber and do not encase either cathode lead or steel reinforcement. Consequently, there is no metal in the rail to expand, open up joints or crack the rail; no treeing.

The barrel has also a number of additional distinctive mechanical features.

New Black Finish

The Jetal Process (patent pending) which has been developed by the Alrose Chemical Company 80 Clifford Street, Providence, R. I., is a chemical process of coloring all grades of common iron or steel by immersion in aqueous bath at a comparatively low temperature for about 5 minutes. The color obtained is said to be uniform and jet black; no plating, spraying or baking are required.

The work can be handled on racks or in baskets or barrels. It is stated that the preliminary cleaning does not have to be as thorough as for plating, but oil or rust must be removed.

Some of the properties claimed for this finish are: no change of dimensions; no chipping, scaling, peeling or discoloring; work can be stamped and shaped after the finish is applied.

Applying the Jetal Finish

Rubber Joints

The United States Stoneware Company, Akron, Ohio, has developed and patented a rubber joint called "Flexlock" for joining two pieces of chemical stoneware pipe. This type of joint makes it possible to use bell and spigot pipe for all purposes, including pressure lines, reducing the installed cost by as much as 50 per cent.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Two Post General Purpose Presses; with rigid gate guide above and below the tools, large open tool space, ease of repairing parts in tool room, maximum amount of light on tools, etc. Waterbury Farrel Foundry and Machine Company, Waterbury, Conn.

Convertible Electric Motors; offering all standard frequencies, ranging from 110 to 220 volts. Harnischfeger Corporation, West National Avenue, Milwaukee, Wis.

High Intensity Vapor Lamp. General Electric Company, Schenectady, N. Y.

Special Tapered Bearings; applicable to broaching lathes. Bantam Ball Bearing Company, South Bend, Ind.

Corinco Cork Tile; in a wide range of standard and special sizes in light, medium and dark brown with varying shades in two thicknesses. Cork Insulation Company, Inc., 155 E. 44th Street, New York.

Quick Setting Acid Proof Cement, which will harden by setting within 36 hours. Technical Products Company, Pittsburgh (15), Pa.

Horizontal Wet Abrasive Cutting Machine; designed for making long cuts through flat or slab stock, but bar stocks can also be cut; Model 302. Andrew C. Campbell Division of American Chain Company, Inc., Bridgeport, Conn.

Laboratory Table Troughs, made of acid-proof chemical stoneware out of "de-aired (vacuumized)" clays. U. S. Stoneware Company, Akron, Ohio.

Plicote; for the acid or alkali process industries; for the protection of metal, wood or concrete against corrosion and deteriorations. The Watson-Standard Company, 225 Galveston Avenue, Pittsburgh, Pa.

Pick-Proof Lock. Dudley Lock Company, 235 W. Randolph Street, Chicago.

Airplex. A dry super air filter. Davies Air Filter Company, 390 Fourth Avenue, New York City.

Multigrip Floor Plate for Anti-Skid Surfaces. Illinois Steel Company, 208 S. La Salle Street, Chicago, Ill.

Flexlock joints are said to be resistant to chlorine, sulphuric acid and nitric acid. Corrosive solutions which ordinarily attack rubber tend to form an outer or protective incrustation on the forward or exposed edge of the rubber joint, effectively preventing further deterioration. A joint angularity of 15 degrees is possible.

New Industrial Alkali

A new industrial alkali is announced by the Philadelphia Quartz Company, Philadelphia, Pa., called Sodium Sesquisilicate with the trade name Metso 99. It contains approximately 36.89% of alkali (Na_2O), 23.83% silica (SiO_2), 39.2% water. It is said to be freely and completely soluble in water with only a slightly positive heat of solution. At a concentration of 0.1% by weight, it produces a pH of 11.6.

Metso 99 has, it is claimed, the following valuable properties:

1. Maintenance of pH until almost all of the alkali is introduced.
2. Inhibiting powers necessary in cleaners.
3. Free rinsing.

Metso 99 is recommended for electroplating cleaners, for the removal of paraffin oils, drawing compounds and lubricating greases usually done in still tanks without the mechanical aid of sprays or the electric current.

New Type Monel Metal

After 12 years of research and development, engineers of The International Nickel Company, 67 Wall Street, New York, have produced a new type of Monel Metal which combines the strength of alloy steels with the corrosion resistance of regular Monel Metal.

This new alloy, known as K Monel, was announced at the recent meeting of the American Institute of Mining and Metallurgical Engineers by Dr. W. A. Mudge, metallurgist of the Huntington, West Virginia, works of the company where it was perfected. (See page 82 of this issue).

In analysis the new alloy is practically the same as regular Monel Metal with the exception of about 4 per cent added aluminum and fractional amounts of other elements. It is readily heat treated and its fully hardened condition shows Brinell values above 350, though it is available also in softer forms. Its tensile strength runs higher than 160,000 pounds a square inch.

Catalogs

Aluminum Alloy Castings. British Aluminum Company, Ltd., 30 Rockefeller Plaza, New York. This catalog is substantially the same as the previous editions, but it has been brought up-to-date by the inclusion of the latest specifications of the Society of Automotive Engineers and the American Society for Testing Materials in condensed form. (312)

Air-Cooled Transformers. General Electric Company, Schenectady, N. Y. (313)

Refractory Products and Service. A series of bulletins No. 101; 201-205 inclusive; 301-304 inclusive; covering refractories in all forms for all types of industries including fire clay brick, plastic fire brick, chrome base high temperature cement, and fire clay and cyanite base high temperature cements. General Refractories Company, Philadelphia, Pa. (314)

Chase Condenser Tubes in 15 Alloys. Chase Brass and Copper Company, Waterbury, Conn. (315)

Koven Industrial Equipment. A 52-page catalog describing the equipment and service rendered by L. O. Koven and Brother, Inc., 154 Ogden Ave., Jersey City, N. J., to industries of all types. Some of the sections of special interest to the metal industries are: 1. Tanks for process and storage; 2. Equipment for chemical and allied industries; 3. Mixers; 4. Equipment for machinery and metal products plants, etc.; 5. Containers; 6. Sinks and tables. (316)

Special Washers and Stampings. A handbook listing over 19,000 shapes, sizes and specifications of washers, stampings and miscellaneous assembly parts. Wrought Washer Manufacturing Company, 2100 S. Bay Street, Milwaukee, Wis. (317)

Diesel Engines: vertical, four-cycle direct injection. Bulletin S-500-B6D. Worthington Pump and Machinery Corporation, Harrison, N. J. (318)

Oil Proof Synthetic Rubber. Thiokol Corporation, Trenton, N. J. (319)

Pyro Immersion Pyrometer for Non-Ferrous Metals. Pyrometer Instrument Company, 103 Lafayette Street, New York. (320)

Resistance Alloys of All Types. The C. O. Jelliff Manufacturing Corporation, Southport, Conn. (321)

The Proper Installation of Lead and Cast Iron Soil and Waste Pipe Systems and Lead Service Pipe; also other data on sizes, weights, etc., of lead service and waste pipe. Lead Industries Association, 420 Lexington Avenue, New York. (322)

Bakelite Varnish, Enamel, Lacquer and Cement; heat hardenable. This booklet describes in detail the characteristics, uses and technique involved in the handling of these materials, all of which require baking to bring out their best properties for use in a variety of industries. Bakelite Corporation, 247 Park Avenue, New York. (323)

Three Lea Products for Buffing and Plating. Learok to eliminate packing up, excessive washing or scrubbing; Lea Compound to eliminate preliminary operations prior to bright or satin finishes, also final washing and drying; Lea Nickel Glo, an addition agent for nickel plating baths, producing a more brilliant plate. Lea Manufacturing Company, Waterbury, Conn. (324)

New Motors Bulletins; 507, 510 and 514, describing different types of motors. The Louis Allis Company, Milwaukee, Wis. (325)

Nassau. A 12-page magazine which will be published bi-monthly by the Nassau Smelting & Refining Company, 50 Church Street, New York; of interest to non-ferrous foundrymen using ingot metals. (326)

Truflex Thermostatic Bimetal. A laminated material made by fusing together two sheets of metal, one having high thermal expansion and the other, low. Bulletin 301. General Plate Company, Attleboro, Mass. (327)

Progress in Forging Machines. National Machinery Company, Tiffin, Ohio. (328)

Rotary Positive Air Pumps. "They Take Up Their Own Wear." Leiman Brothers, Inc., 146-181 Christie Street, Newark, N. J. (329)

Fuel Oil Burners; impact-expansion, natural draft, air cushioned flame. Leiman Brothers, 23 Walker Street, New York. (330)

Anaconda Beryllium Copper. A heat treatable copper alloy possessing exceptional qualities. This catalog covers the forms available, applications, fabrications, heat treatment, physical properties, chemical properties and metallography. American Brass Company, Waterbury, Conn. (331)

Save time. Use the coupon below to get any of the above catalogs or bulletins, or for data on any subject not mentioned this month. METAL INDUSTRY will see that you get them promptly.

METAL INDUSTRY
116 John Street, New York.

(Insert below the number in parentheses at end of each item desired.)

I wish to receive the following catalogs mentioned in March, 1935 ....

....

I want information on the following equipment or materials also: ....

....

Associations and Societies

American Foundrymen's Association

222 W. Adams St., Chicago, Ill.

Toronto Selected as Place of 1935 Convention of American Foundrymen's Association

The American Foundrymen's Association announce the selection of Toronto, the largest foundry center in the Dominion of Canada, as the place of the 1935 convention of the Association. The dates will be August 19 to 23 inclusive.

This meeting, which will be held without an exhibit, will be patterned after the successful technical meeting held in Chicago at the Edgewater Beach Hotel in 1927, pleasantly remembered by all who attended. The entire program will be devoted to technical sessions, shop courses, round table discussions, committee meetings, plant visits, and the numerous social functions that add so much to the enjoyment of Convention Week.

In selecting the week of August 19th for the annual convention, the Board of Directors of the Association intentionally has made it possible for foundrymen to combine attendance at the outstanding event of the year for the foundry industry with the wonderful vacation facilities offered in Canada.

Canadian National Exposition

The closing of the convention on Friday noon will coincide with the opening of the Canadian National Exposition, an internationally known fair held each summer. Special features will be provided for the visiting foundrymen on Friday afternoon and evening, as will be announced later.

Hotel Headquarters

The Royal York, said to be the largest hotel in the British Empire, offers unusual facilities for every feature of convention activity. The committee has secured a flat rate of $4.00 for single rooms and $7.00 for double rooms. Reservations can be made for rooms for Convention Week by addressing the Convention Manager of the Royal York Hotel.

Complete information on points of interest in Canada, motor routes, etc., will be supplied on request by the Toronto Convention and Tourist Association, E. R. Powell, Managing Director.

Connecticut Non-Ferrous Foundrymen's Association

Care of L. G. Tarantino, 523 W. Taft Avenue, Bridgeport, Conn.

The January meeting was held on Tuesday, January 15th at the Hotel Garde in New Haven, presided over by chairman, **David Tamor** of the **Reading, Pratt and Cady Company,** Hartford. The subject of discussion was Facings, Dressings and Partings, read by **E. E. Seeley** of the **Bennett and Seeley Company** of Bridgeport, Connecticut.

Frank Diana and **Byron Reid** were appointed a technical committee to compile data sheets of the technical sessions of this association for future mailing to members.

The next meeting was held on Tuesday, February 19th, at the same place. The speaker was **L. A. Ward,** assistant metallurgist to the **Chase Companies,** Waterbury, who spoke on deoxidation and degasification of cast bronze and brass.

American Electro-Platers' Society

1935 Convention June 10-11-21-13

"How It Is Done"

The next Annual Convention of the American Electroplaters Society will take place at the Stratfield Hotel, Bridgeport, Conn., June 10 to 13, 1935, inclusive. The plans already in progress under the supervision of the 1935 Convention Committee indicate that this will undoubtedly be the finest educational as well as social event in the twenty-six years that the Society has existed. To those who are acquainted with the usual high technical and scientific standards of this Society's annual conventions, no more need be said.

It will also be possible for those who attend the convention to enjoy in addition to the papers and entertainment a whole day's trip through some of the largest and most modern metal finishing plants in New England.

Naturally, the full membership of the American Electro-Platers' Society is expected to attend the convention. Nonmembers who are interested in electroplating and finishing are also urged to attend and receive the benefits of the educational program to be presented, as well as the social contacts.

History and Ideals: The American Electro-Platers' Society was established in 1909, with the object of advancing the art and science of electroplating through the joint efforts of the membership, the latter to include only experienced electroplaters, including platers who are owners of plants, of job shops, executives of such plants or shops, and experienced platers in general. Throughout its history, the Society has led in the progress of the industry. It has branches in all the principal electroplating centers of the United States and Canada. These branches hold regular monthly meetings where scientific and practical information is exchanged, and annual educational sessions where the best of the year's research and experience by members and invited speakers are presented to all who are interested. The National Society holds an annual convention each year, and the 1935 Convention will be the twenty-third. Here are presented for three or four days, the latest information available on the science and practice of electroplating. Many of the papers are by members, and many by invited speakers from research institutions, universities, Government bureaus and branches, etc. Membership in the American Electro-Platers' Society is open to all experienced plating executives, whether they are employees or employers. The membership today numbers about 1,500, many of whom are owners or executives of plants and shops.

Special Transportation: Plans are now afoot for the arrangement of special fare transportation to the convention city from all parts of America. It will, therefore, profit all who think of going to Bridgeport to keep in touch with the Convention Committee, or with the Branches in their localities, until the arrangements are finally announced.

As a suggestion—why not put aside a small amount of money weekly until the convention time, and make that part of your vacation? You'll want to see Bridgeport in 1935.

Golf: The Publicity Committee is glad to report for the benefit of those that play golf that the Mill River Country Club, which has one of the finest 18-hole courses in the East has offered its

hospitality to members and their friends attending the convention. Those that desire to play may do so at any time from Sunday, June 9th until June 14th inclusive. The Greens fees for the whole day will be the nominal sum of $1.00.

Tercentenary: This year Connecticut will celebrate the three hundredth anniversary of its settlement and there will be formal State functions, exhibitions and festivities in many places with opportunities offered for visits to our industrial and business centers, our public parks and museums, and the seats of learning which have brought fame to our State. This is, therefore, an excellent year to visit the State.

It will be of aid to the Committee if those thinking of attending the convention signify such intentions as early as possible.

Exhibition

We wish to correct a mistaken impression which may be gained from a report in our January issue on the plans for the coming convention which will be held in Bridgeport, Conn., June 10-13, 1935. It was stated that the materials to be shown at the convention would be confined to New England and perhaps even Connecticut. The fact is that the exhibition of plating equipment and supplies will be nation-wide in scope, as shown by the list of companies who have reserved space.

The Exhibition will open Monday, June 10 at 1 P. M. and will close Friday, June 14 at 10 P. M. It will be the most complete Exhibition of its kind ever held, bringing together more exhibitors and more visitors than any other similar exhibition.

In the "show" you will see the best and most improved materials, equipment, apparatus and machinery used in the metal finishing field. A number of the educational sessions will be held in a room in the Exhibition building. You will find over seventy-five leading manufacturers and jobbers displaying their products, among which will be many outstanding nationally known concerns.

The New England market, original field of metal finishing, affords an expansive and almost unlimited field for sales opportunities. This Exhibition offers you the opportunity to contact the personnel and buying powers of New England concerns during the period of the Exhibition.

In itself, the Exhibition will prove to be very highly educational due to the many developments of the past few years, all brought together under one roof. The space already contracted for shows the interest in a real Exhibition which has the full cooperation of every society member working together to make this convention and exhibition the outstanding affair of its kind ever held. Up to the present time one-third of the booths have been contracted for by the following firms:

The following firms have already taken space:

G. S. Blakeslee & Company, 19th St. and 52nd Ave., Chicago, Ill.

Egyptian Lacquer Manufacturing Company, 90 West St., New York.

Rex Products & Manufacturing Company.

The Udylite Company, Detroit, Mich.

Chandeysson Electric Company.

Pyrene Manufacturing Company.

Lea Manufacturing Company, 16 Cherry Ave., Waterbury, Conn.

Contract Plating Company.

J. B. Ford Company, Wyandotte, Mich.

Frederic B. Stevens, Inc., Larned and Third Sts., Detroit, Mich.

Zapon Company, Stamford, Conn.

Seymour Manufacturing Company, Seymour, Conn.

Tuttle Chemical Company, 245 Seventh Ave., New York.

Hanson-Van Winkle Munning Company, Matawan, N. J.

Lasalco, Inc., 2822-38 La Salle St., St. Louis, Mo.

Grasselli Chemical Company, 629 Euclid Ave., Cleveland, Ohio.

Maas & Waldstein, 440 Riverside Ave., Newark, N. J.

N. Ransohoff, Inc., W. 71 St. at Millcreek, Carthage, Cincinnati, Ohio.

Apothecaries Hall Company, Waterbury, Conn.

Norton Company, Worcester, Mass.

At the rate contracts are being received all available space will soon be allotted.

Some of Papers Scheduled

Spectrographic Analysis as Applied to Electroplating, by Dr. D. T. Ewing, Michigan State College, Lansing, Mich.

X-Ray Diffraction of Electrodeposited Metals, by Dr. H. R. Isenburger, St. John's X-Ray Laboratories, Long Island, City, N. Y.

Measuring Thickness of Electrodeposits with a Microscope, by T. G. Clement, Bausch & Lomb Optical Company, Rochester, N. Y.

The Dropping Test for Zinc and Cadmium Deposits, by Paul W. Strausser, A. E. S. Research Associate, National Bureau of Standards, Washington, D. C.

A. E. S. Needs a Motor Generator Set

The Society would like to borrow an old motor generator set—must be very old for exhibition purposes Will be glad to pay all transportation charges. If you know of any, write R. T. Phipps, 271 Grovers Avenue, Bridgeport, Conn.

Newark Branch A. E. S.

Care of George Reuter, 784 Prospect Street, Maplewood, N. J.

The 15th annual banquet and educational session of the Newark Branch of the American Electroplaters' Society will be held at the Hotel Douglas, Hill Street, Newark, on Saturday, April 27th, 1935. Nelson Sievering, Librarian of the Branch has arranged an all-day program.

Morning Session, 9:30 A. M.

Recent Developments in the Manufacture of Brass by Benjamin McGar, Chase Brass and Copper Company.

New Dipping Method for Zinc and Cadmium Coatings by Paul Strausser, National Bureau of Standards, Washington, D. C.

A paper will also be given by Donald Wood of Reed and Barton.

Afternoon Session, 2:30.

What Happens in a Plating Solution? by W. H. Phillips of the General Motors Corporation, Detroit, Mich.

All talks will be illustrated.

The entertainment has been arranged for by Mr. Morrow of the Egyptian Lacquer Manufacturing Company.

The banquet will be held at 7 P. M., arrangements having been made by the banquet committee under the chairmanship of Horace Smith, "Nuf Sed!"

Detroit Branch, A. E. S.

A Regular Meeting of the Detroit Branch of the American Electro-Platers Society was held on Friday evening, February 1st at 8:00 P. M., at the Hotel Statler. Col. J. H. Hansjosten presided, and a very good attendance was present.

Mr. Eldridge, Chairman of the Educational Program Committee, reported that the meeting for February 21st to be held in the Woman's Club in conjunction with the American Chemical Society, would be addressed by Dr. Fink of Columbia University, N. Y., and that all arrangements had been made for same.

It was also decided to hold the regular meeting on March 1st.

It was moved, seconded and carried to receive applications for membership up to the April meeting without a $5.00 fee.

The speaker of the evening was Dr. Harry P. Coats of the Firestone Tire & Rubber Company, Akron, Ohio, who gave a wonderful talk on brass plating, illustrated with slides. It was very educational and interesting.

While brass plating is not a new art exactly, still it is quite unique in that this Company does not do brass plating for ornamentation or color. However, the color is maintained. The plating they do on steel principally is to give the rubber, which is to be vulcanized on to these steel parts, the necessary adhesion, which otherwise it would not have. The paper will be published in the Review.

At the close of his address, there was a bombardment of questions, and he was very apt in his answers. In fact it seemed as though he just realized the questions that would be asked and had the answer immediately.

Milwaukee Branch American Electroplaters' Society

Care of Frank J. Marx, 1431 W. Cherry Street, Milwaukee, Wis.

The Milwaukee Branch of the American Electroplaters' Society will hold their annual educational session and smoker at the Hotel Schroeder in the Green Room, corner 5th Street and Wisconsin Avenue, Saturday, March 30th, at 8. P. M. All those who are interested in electroplating are cordially invited. The meeting will be worth while not only to platers but to general

foremen, superintendents, research engineers and owners of plating plants.

George B. Hogaboom of the Hanson-Van Winkle-Munning Company, Matawan, N. J., will speak on the subject, **"What Is Under the Plate,"** and illustrate his talk with lantern slides.

W. H. Phillips, of the **General Motors Corporation,** Detroit, Mich., will give a pictorial study of plating conditions, also with lantern slides, showing what is actually taking place in plating solutions.

H. S. Gilbertson, President of the American Electroplaters' Society will speak on the Benefits of Membership in the American Electroplaters' Society.

The educational program will be followed by entertainment and refreshments for which Milwaukee is famous. A charge of $1.75 per person will cover everything. Address communications to Dan Wittig, 1221 N. 3rd Street, Milwaukee, for information.

International Fellowship Club

The Convention Committee of the Bridgeport Branch which is in charge of all arrangements for the coming Annual Meeting, has asked the International Fellowship Club to take an active part in the convention to be held June 10-13. The Club has therefore, decided to hold Open House on the first night of the convention, Monday, June 10th. Detailed information will be available as soon as arrangements have been completed.

One of the innovations will be a golf tournament sponsored by the Fellowship Club, which will be open to all members of the A. E. S. the I. F. C. and guests. This idea was brought up at the last convention in Detroit. Of course, arrangements could not be made quickly enough to hold the tournament then, but the plan was so popular that it was decided to put it into effect definitely at the 1935 meeting.

H. E. Pape of the Stanley Works in Bridgeport very kindly extended a cordial invitation to the American Electroplaters' Society to make their golf headquarters at the Mill River Country Club, located on the outskirts of Stratford, approximately three miles from Bridgeport. This Club has available for entertainment a very sporty 18-hole golf course, tennis court and a dining room. Charges will be reasonable.

All those who expect to attend the convention, are urged to put this golf tournament on their list of entertainment features.

American Society for Testing Materials

260 South Broad Street, Philadelphia, Pa.

Committees of the American Society for Testing Materials held meetings in The Warwick hotel, Philadelphia, during A. S. T. M. Committee Week, March 4-8. The research and standardization work sponsored by the respective committes were reviewed and plans made to present the results to the Society. Those committees working on problems of non-ferrous metals were:

Subcommittees of B-2 on Non-Ferrous Metals and Alloys
B-3 on Corrosion of Non-Ferrous Metals and Alloys
B-5 on Copper and Copper Alloys
B-6 on Die-Cast Metals and Alloys
Subcommittees of E-1 on Methods of Testing
Subcommittees of E-4 on Metallagraphy
Coordinating Committee on Non-Ferrous Metals and Alloys

A symposium on Paint was the technical feature of this Regional Meeting. Fourteen formal papers were presented at the two sessions, morning and afternoon, devoted to the symposium, which included "Lacquer and Lacquer Testing" by T. E. Eastlack, Director, Parlin, N. J., Laboratory, E. I. du Pont de Nemours & Company.

Faraday Society

13 South Square, Gray's Inn, London, W. C. 1, England

A general discussion will be held on the Structure of Metallic Coatings, Films and Surfaces at the Imperial College of Science and Technology, London, S. W. 7, England, March 29-30. The provisional program is as follows:

PART 1: ELECTRON DIFFRACTION METHODS

1. **Prof. C. H. Desch** (London).
   Introductory Paper.
2. **Prof. G. P. Thomson** (London).
   An Apparatus for Electron Diffraction at High Voltages."
3. **Prof. G. I. Finch** (London).
   "Electron Diffraction and Surface Structure."
4. **Prof. W. E. Laschkarew** (Leningrad).
   "The Problem of Inner Potential in Electron Diffraction."
5. **Prof. F. Kirchner** (Leipzig).
   "Electron Diffraction of the Structure of Condensed Metallic Films and Surfaces."
6. **H. G. Hopkins** (London).
   "The Thickness of the Beilby Layer on Polished Metals."
7. **Prof. J. J. Trillat** (Besancon).
   (Title not yet received.)

PART II: THE STRUCTURE OF METALLIC COATINGS

8. **Prof. E. N. daC. Andrade** (London).
   "The Crystallization of Thin Metal Films."
9. **Prof. L. Tronstad** (Trondheim).
   "The Validity of Drudes' Optical Method of Investigation of Thin Films."
10. **Prof. L. S. Ornstein** (Utrecht).
    "Optical Research on Evaporated Metal Layers."
11. **D. J. Macnaughton** (London).
    "The Determination of the Structure of Electrodeposits by Metallurgical Methods."
12. **Prof. M. Schlotter** (Berlin).
    "The Influence of the Structure of Electrodeposited Metals on its Chemical and Physical Properties."
13. **Prof. V. Kohlschutter** (Berne).
    "On 'Somatoid' Elements of Structure in Electrolytic Metal Deposits."
14. **Dr. E. Liebreich** (Berlin-Halensee).
    "The Controlling Influence of Films on the Structure of Electrochemical Metallic Coatings."
15. **Dr. E. Muller** (Dresden).
    "Cathodic Films in the Electrolytic Reduction of Aqueous Chromic Acid Solutions."
16. **Dr. W. Blum and Dr. C. Kasper** (Washington).
    "The Structure and Physical Properties of Nickel Deposited at High Current Densities."
17. **Dr. S. Glasstone** (Sheffield).
    "Electrode Potentials and the Nature of Electrodeposits."
18. **Prof. A. Portevin** (Paris).
    "Contribution to the Experimental Study of the Influence of the Support upon the Structure of Electrolytic Deposits."
19. **A. W. Hothersall** (London).
    "Influence of the Base Metal of the Structure of Electrodeposits."
20. **W. A. Wood** (London).
    "Differences in the Structure of Electrodeposited Metallic Coatings shown by X-Ray Diffraction."
21. **L. Wright, H. Hirst and J. Riley** (Manchester).
    "The Structure of Electrolytic Chromium."
22. **Prof. A. Glazunov** (Pribram).
    "Determination of the Phase-Structure of Metallic Protective Coatings by Anodic Dissolution."
23. **Dr. E. Reininger** (Leipzig).
    "Improvement of the Quality of Sprayed Metallic Coatings by the Use of Non-metallic Intermediaries and Supports."
24. **E. J. Daniels** (London).
    "Factors Influencing the Formation of Hot-dipped Tin Coatings."

British Institute of Metals

36 Victoria Street, London, S. W. 1, England

The annual general meeting of the British Institute of Metals was held on March 6 and 7 at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S. W. 1. A report giving abstracts of the papers at this meeting will be published in our April issue.

Japanese Metal Industries Exhibition

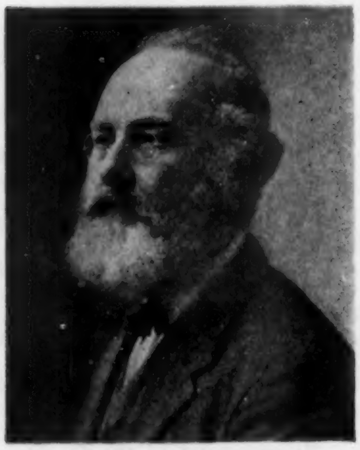
An Exhibition of Metal Industries will be held in the Commercial House in Osaka, Japan, May 10-31, 1935. At this exhibition will be shown castings, rolled shapes, forgings, extruded shapes, heat treating methods, electroplated products, welded parts, raw materials and equipment and supplies for these industries. Full details can be obtained from Agne, Okamoto, near Kobe, Japan.

Personals

George C. Stone

George C. Stone was awarded the James Douglas Medal of the American Institute of Mining and Metallurgical Engineers at the meeting held in New York, February 18-21. The medal was awarded for his contributions to the chemistry and metallurgy of zinc.

Mr. Stone went with the New Jersey Zinc Company in 1882, three years after his graduation from the Columbia School of Mines, and remained with them in various capacities until his retirement on August 6, 1929, when he was 70 years old. He has been one of the leading contributors to the chemistry and metallurgy of zinc. He has been in all parts of the world, observing practice in the important foreign plants. In recent years he has given much of his thought to the uses and marketing of zinc. He



GEORGE C. STONE

is still known as the human encyclopedia for the New Jersey Zinc Company.

Mr. Stone's hobby has also brought him fame. He is deeply interested in ancient armor and arms, especially of oriental countries. He has one of the finest collections in the world and has contributed liberally to the Metropolitan Museum of Art in New York.

H. A. Anderson

H. A. Anderson, vice-chairman of Committee B-2 of the American Society for Testing Materials is a Metallurgical Engineer for the Western Electric Company. He is a graduate of Northwestern University (B. S., 1915; C. E., 1916). He was assistant engineer, rails and ties, Southern Pacific Railroad, 1916-1917; assistant engineer-physicist, National Bureau of Standards, 1917-1919; engineer of tests, U. S. Naval Aircraft Factory, Philadelphia, 1919-1920; and since 1921 has been successively materials engineer, metallurgist and in his present position for the Western Electric Company.

Mr. Anderson was elected a member of the A. S. T M. Executive Commit-

H. A. ANDERSON

tee. In addition to serving as vice-chairman of Committee B-2 on Non-Ferrous Metals and Alloys, he is an active member of other A. S. T. M. committees, including B-6 on Die-Cast Metals and Alloys (chairman 1930-1932).

Henry J. Nash has been appointed New Jersey representative for the Magnus Chemical Company of Garwood, N. J., to take the place of the late Mr. George Christensen.

Ray P. Tarbell was recently appointed manager of the Welding Division of The Ideal Electric & Manufacturing Company, of Mansfield, Ohio.

W. F. Gradolph was elected Vice President in charge of sales of The DeVilbiss Company, Toledo, Ohio, by the Board of Directors of that organization early this week. Mr. Gradolph has been associated with The DeVilbiss Company for the past twenty-four years.

L. K. Lindahl

At their annual meeting, the directors of The Udylite Company, Detroit, Michigan, elected L. K. Lindahl vice president and general manager of the Company.

Mr. Lindahl's appointment comes after twelve years of association with The Udylite Company. In 1923 shortly after leaving the University of Illinois, he joined the sales engineering staff in Kokomo, Indiana, the headquarters of the Company at that time. In recognition of his sales and executive ability, Mr. Lindahl was promoted to the position of sales manager in 1929, the Company having since moved its general offices and laboratories to Detroit.

As Sales Manager, Mr. Lindahl's duties broadened with the activities of the Company until, in addition to outlining sales policy, they included tech-

L. K. LINDAHL

nical supervision and product development.

Mr. Lindahl is a member of Sigma Chi Fraternity, Rotary Club and is active in Detroit civic affairs.

Obituaries

Charles Boltz

Charles Boltz, president of the Milwaukee Aluminum and Brass Foundry Company, Milwaukee, died recently at his home. Mr. Boltz was born in Rome, Wis., and had been a resident of Milwaukee for 45 years. He had organized the Milwaukee Aluminum and Brass Foundry Company in 1905.

E. E. Berliner

E. E. Berliner for a number of years connected with Alloys and Products Company, Oak Point Ave., Bronx, New York, and previous to that with the Michigan Smelting and Refining Company, Detroit, died at his home in Cleveland recently. Mr. Berliner was 59 years of age.

James V. Martin

James V. Martin, whose death was noted in our February issue, was a well known figure in the foundry industry. He had been for 18 years with the Monarch Engineering and Manufacturing Company, Baltimore, Md., working in manufacturing operations, building furnaces, supervising their installations and in sales. Previous to his work with the Monarch company, he had been with the old National Supply Company of Baltimore, which operated a brass foundry. He was thoroughly posted on foundry metallurgy and practical operations.

Mr. Martin's character and integrity were of the highest. He was a pleasant, affable and agreeable personality and made friends all over the United States.

Charles William Henger

Charles William Henger, for thirty years vice president of the Chase Companies, Waterbury, Conn., died recently in Pasadena, Calif. Mr. Henger was 76 years of age and had lived in Pasadena since 1925.

Industrial and Financial News

News of the Codes in the Metal Industries

ELECTROPLATING

The following District Code Committee has been approved.

District IV. **R. M. McCandlish,** Kansas City, Mo.; **W. E. Long,** New Orleans, La.; **E. Deubler, E. Musick,** and **L. A. Lambert,** all of St. Louis, Mo.

ALUMINUM

The Code of the Aluminum Industry has been extended to April 6, 1935, with a proposed amendment regarding the sale of virgin aluminum.

INGOT METALS

Members of the Code Authority of the industry engaged in the smelting and refining of secondary metals into brass and bronze alloys in ingot form, approved by the Administration, are as follows: **George H. Bangs,** New York; **L. Chapman** and **I. Glueck,** both of Chicago; **R. C. McElroy,** Erie, Pa.; and **Clarence B. White,** Philadelphia, Pa.

NON-FERROUS FOUNDRY

Members of the Code Authority approved by the Administration are as follows: **D. D. Francis,** National Bronze & Aluminum Foundry Company, Cleveland, aluminum permanent mold castings division representative; **H. A. White,** National Bearing Metals Corporation, Pittsburgh, steel and rolling mill castings division representative; **H. E. Smeeth,** Smeeth-Harwood Company, Chicago, blast furnace castings division representative; **N. H. Schwenk,** Cramp Brass and Iron Foundries Company, Philadelphia, miscellaneous sand castings division representative; **N. K. B. Patch,** Lumen Bearing Company, Buffalo, Code Authority Chairman, and **A. B. Norton,** Aluminum Company of America, Cleveland.

COPPER, BRASS, BRONZE AND RELATED ALLOYS

A recent report in the trade press stated that bidding on requisition No. 89R-32741 issued by the Purchasing Department of the City of New York, which closed on January 23, 1935, revealed many violations of the Code of Fair Competition for the copper, brass, bronze and related alloys trade. The questions were turned over to the Code Authority for that industry. Some of the violations consisted of quoting prices contrary to the open prices filed by various members of the industry. These bids were later withdrawn and the bidders promised to adhere to the Code in the future.

MISCELLANEOUS SAND CASTINGS DIVISION OF THE NON-FERROUS FOUNDRY INDUSTRY

Members of the Code Authority approved by the Administration are:

District 1, **J. A. Duncan,** William Duncan Company, E. Boston; District 2, **C. E. Schley,** Philadelphia Brass and Bronze Company, Philadelphia; District 3, **T. S. Hemenway,** Metal and Alloy Specialties Company, Buffalo; District 4, **J. P. Jeffries,** Shenango Penn Mold Company, Dover. Ohio; District 5, **Vaughan Reid,** City Pattern Works, Detroit; District 6, **F. L. Hayes,** Chicago Hardware Foundry Company, Chicago; District 7, **G. B. Miller,** Loeffelholz Company, Milwaukee; District 8, **C. Wegelin,** Dixie Bronze Company, Birmingham, Ala.; District 9, **William L. Heckmann,** National Art Bronze Works, St. Louis; District 10, **M. S. Greenberg,** M. Greenberg's Sons, San Francisco.

METAL TANK INDUSTRY

The Non-Ferrous Hot Water Tank Manufacturing Industry and the Metal Tank Industry through their Code Authorities have applied for permission to amend their codes. Details can be obtained from the Code Authority of the above industry at 10 State Street, Boston, Mass. Deputy Administrator in charge is Beverly S. King, Room 3080 Department of Commerce Building, Washington, D. C.

INDUSTRIAL FURNACES

The Code Authority for the Industrial Furnace Manufacturing Industry has made application for the approval of a $7,000 code administration budget for the calendar year 1935.

VALVES AND FITTINGS

The Code Authority for the Valve and Fittings Manufacturing Industry has made application for the approval of a budget for the calendar year 1935, totalling **$97,800.**

Metal Developments

Another great tragedy of the air occurred. During the past month the **Macon,** the last word in dirigibles collapsed while in the air and fell into the sea off the California coast. As usual there was talk of imperfect materials. One witness, Dr. **Carl Arnstein,** chief engineer of the **Goodyear-Zeppelin Corporation** was reported to have testified that some of the structural material, aluminum alloys, had a guaranteed minimum yield point and tensile strength lower than was expected by the builders. He later explained that he had not expressed dissatisfaction, as the fault found with samples was later corrected, and that the Duraluminum structural shapes as shipped had a minimum yield point of 44,000 pounds per square inch, which was up to the standard set.

The **Moto-Meter Gauge and Equipment Corporation,** Toledo, Ohio, recently advised its 550 workers that they would receive wage increases ranging from 5 to 14 per cent. We hope this is a sign of the times.

According to the **Bureau of the Census,** shipments of plumbing brass totalled 8,924,969 pieces in 1934 against 9,299,513 pieces in 1933. All of which shows that building is not yet booming.

One of the large oil companies has recently installed **chromium plated copper tubing** on its filling stations, thus combining the resisting qualities of copper with the attractive finish of chromium. We should like to see more of the same.

The **Mellon Institute of Industrial Research** in Pittsburgh, announces the discovery of a new enamel called "Hommelaya," developed by Dr. J. E. Rosenberg, director of research for the O.

Corporation Earnings

Net profit unless followed by (L) which is loss.

	1934	1933
Canadian Bronze Company, Ltd.	$140,415	$110,441
Ohio Brass Company	500,271	54,260
Parker Rust Proof Company	691,067	403,958
E. I. du Pont de Nemours & Company	46,701,465	38,895,330
Bridgeport Brass Company	576,636	314,581
New Jersey Zinc Company	3,788,380	3,994,072
Mueller Brass Company	131,797	29,060
Savage Arms Corporation	27,468	236,325 (L)
McCord Radiator & Manufacturing Company	27,509 (L)	24,757
Bristol Brass Corporation	225,140	305,000
National Lead Company	4,200,188	3,828,329
St. Joseph Lead Company	815,328	300,175
Federal Mogul Corporation	102,028	61,606
Arrow Hart & Hegeman Electric Company	254,928	17,288
National Bearing Metals Corporation	329,552	372,031
Oneida Community, Ltd. (Canada)	334,287	405,926
Walworth Company	234,038 (L)	881,629 (L)
New Haven Clock Company	98,560	126,870 (L)
General Bronze Corp.	460,239 (L)	39,249

Hommel Company, Pittsburgh, Pa., and William J. Baldwin, Industrial Fellow at the Mellon Institute. It is a better product it is stated, produced at a lower unit cost.

Newark, N. J., is staging a huge Trade Exhibit in April, which will feature New Jersey industrial and civic progress. **Newark on Parade** is the title of the exhibit. Full information can be obtained from the headquarters, 611 Chamber of Commerce Building, Newark.

Charles Engelhard, president, **Baker & Company, Inc.,** Newark, N. J., reports that the platinum metals industry continued in 1934 the recovery started in 1933. World consumption of platinum during 1934 is estimated at about 200,000 Troy ounces compared with 175,000 Troy ounces in 1933 and only 75,000 Troy ounces in 1932.

Ireland is the latest newcomer into the aluminum manufacturing field. A **new aluminum factory** has recently been started at Nenagh County, Tipperary, Irish Free State. **P. F. Webster,** a British technical expert on aluminum is managing director of the new factory.

M. Schied in a recent article in a German publication, recommends the use of magnesium powder and tar as a coating for cast iron pots in which aluminum melting is carried on.

G. W. Hofstetter in the Enamelist for October, 1934, recommends putting an electrolytic nickel flash on sheet iron before enameling.

More discussion about **aluminum** and **health.** A recent issue of the Journal of the American Medical Association, describes cancer experiments on rabbits, comparing the use of coal tar with the use of aluminum compounds. It was concluded, as usual, that there is no reason to fear the affect of aluminum or its salts so far as cancer is concerned.

Pewter To-day and Yesterday is the title of an interesting little article in the Dutch Boy Quarterly published by the National Lead Company, 115 Broadway, New York, which recently came to our attention. To be sure the article was published in 1933 but that did not make it any the less interesting to the reader.

An exhibit is being held in the **Metropolitan Museum of Art on Contemporary French and Swedish Decorative Arts.** It includes, among other items, a group of handsome pieces of silverware.

A course in electrochemistry and photochemistry is being offered by **Brooklyn College,** to be given by Dwight K. Alpern, Ph.D. It will consist of 15 weekly lectures and experimental demonstrations on Fridays from 5:30 to 6:10 P. M. in room 104 Willoughby Building, 80 Willoughby Street, Brooklyn. Among the demonstrations to be performed will be the electroplating of metals and the electrodeposition of rubber.

There is trouble in **Abyssinia** between the natives and **Italy.** As usual the fundamental question is raw materials. It has been stated that Abyssinia is rich in natural resources, which include gold, platinum, silver, copper and lead.

The **Brooklyn Navy Yard** will hold a sale of condemned scrap metals including 2,418,240 pounds of ferrous metals and 295,000 pounds of non-ferrous metals. Sealed bids must be addressed to the supply officer, Sales Section, Navy Yard, Brooklyn, N. Y., and endorsed "Bids for purchase of supplies to be opened March 19, 1935, 10 A. M. Eastern Standard time."

In a recent demonstration held at 29 West 39th Street, New York, **Dean George B. Pegram** of the School of Applied Science and **Dr. John R. Dunning** of the Physics Department of **Columbia University** assisted by **H. W. Blakeslee,** Science Editor of The Associated Press, transmitted aluminum into silicon and rhodium into palladium by bombarding the metals with alpha particles generated by the introduction of radon gas in contact with beryllium. The radon gas is a direct emanation of radium. The method was developed by the late Mme. Curie and is described as "artificial radioactivity." This demonstration was held under the auspices of the New York Electrical Society.

Business Items-Verified

Detroit Name Plate Etching Company, announces the removal of their offices and factory to their new building at 1837 E. Larned Street.

Imperial Die Casting Company, Chicago, Ill., has moved into its new plant at 2850 W. Fulton Street. Due to an increase in business, the company found it necessary to move into this plant which is approximately six times as large as that formerly occupied. This firm operates the following departments: tool room, casting shop, grinding room.

General Refractories Company, Philadelphia, Pa., has appointed **Collinwood Shale Brick and Supply Company,** Cleveland, Ohio, as dealer-agents.

A. F. Waltz, president, **Advance Pressure Castings, Inc.,** 34-48 N. 15th Street, Brooklyn, N. Y., producers of die castings of alloys of zinc and aluminum, announces the appointment of **J. R. Schuchardt** as sales engineer for the company in the Metropolitan District. **George A. Meyer** has been appointed production manager and purchasing agent. The company operates a casting shop.

American Machine and Metals, Inc., New York, has acquired the **DeBothezat Corporation,** makers of fans, blowers and other ventilating equipment. A. Ralph Stephan has been appointed vice-president and general manager of the DeBothezat Corporation, general offices of which are now at 100 Sixth Avenue, New York.

Ruemelin Manufacturing Company, 1570 S. First Street, Milwaukee, Wis., manufacturer of sand blasting equipment, dust arrestors, etc., has incorporated without change of name. They will occupy a new factory 80 x 120 ft., to include power plant and offices being built at 3860 North Palmer Street.

Frederic B. Stevens, Inc., Detroit, Mich., manufacturer of foundry facings and supplies, has acquired plant of **Columbian Facing Mills Company,** 93 Stone Street, Buffalo, N. Y., for new branch factory. Plant at Erie, Pa., will be removed to new location and capacity increased. A department will also be established at Buffalo plant for the manufacture of platers' equipment and supplies. **C. J. Menzemer,** heretofore branch manager at Erie, will be in charge.

Phelps Dodge Corporation has sold one of its fabricating subsidiaries, **National Electric Products Corporation** to **W. C. Robinson** and associates of Pittsburgh, Pa. National Electric Products Corporation is a successor to National Metal Molding Company with plant at Ambridge, Pa. Its business consists largely of steel conduit and other allied steel products. The company also does some wire business. Phelps Dodge Corporation retains as its fabricating subsidiary, **Phelps Dodge Copper Products Corporation,** which was formed through the consolidation of **American Copper Products Corporation, British American Tube Company, P-M-G Metal Company, Habirshaw Cable and Wire Corporation,** and **Inca Manufacturing Company.** It fabricates only copper products.

The annual stockholders meeting of **Farrel-Birmingham Company, Inc.,** was held at the main office of the company at Ansonia, Conn., February 21, 1935. Directors and officers were reelected.

New Incorporations

Manville Manufacturing Corporation, 1105 Inland Building, Indianapolis, Ind., was organized by C. J. Manville and associates for the purpose of manufacturing safety and protective devices and equipment. The firm does not manufacture its own castings but uses a great deal of aluminum castings which to date have been bought locally.

Carson-Haymond Industries, Inc., 301 Medical Arts Building, Indianapolis, Ind., has been organized by C. Roscoe Haymond and R. S. Carson, 2124 Broadway, to manufacture metal products. The following departments are operated: bronze, brass and aluminum foundry; machine shop, tool room, casting shop, and polishing.

Reliance Art Metal, Inc., Cincinnati, recently organized by S. C. Dreher, president; G. M. Castelline and C. Bader, is operating a plant at 1107 Jackson Street, for the manufacture of architectural metal products. The following departments are operated: casting shop, cutting-up shop, spinning, tinning, soldering, brazing, polishing, lacquering.

Davies Air Filter Corporation, New York, has been organized by Charles Davies, 390 Fourth Avenue, and associates, to manufacture air filters, ventilating equipment, parts, etc.

News From Metal Industry Correspondents

New England States

Waterbury, Conn.

March 1, 1935.

Production orders and employment in local brass factories continue to hold up well since the first of the year, at least holding their own with the pre-Christmas figures. Recent reports show that 1934 was the best year since 1931.

Judge Carroll Hincks of the Federal Court in New Haven, last month approved the reorganization plan of the **Beardsley & Wolcott Manufacturing Company,** although he reserved decision on the city's plea that its claim for $22,000 in personal property taxes be made a preferred claim. When Judge Hincks' order is issued the plan will obtain an RFC loan secured by a first mortgage and will then pay off the second mortgage. The two present mortgages total $200,000. The other obligations consist of about $250,000 due creditors and the 1,000 shares of capital stock of no par value. It is expected that the RFC loan and an additional mortgage to be obtained later on the equipment and machinery will provide sufficient capital so that operations may be increased whereby the 200 present employees will be increased to 500. No cash payments are provided in any case, all creditors to be given stock or debentures.

E. M. Barnum, Director of Production of the company, was elected Assistant Secretary of the **Waterbury Clock Company** at the annual meeting last month, this being a new position. Other officers and directors were reelected as follows: President, **James R. Sheldon;** vice president, **C. H. Granger;** treasurer, **George H. Close;** secretary, **Carl Kraft;** assistant treasurer, **M. M. Abbott;** directors, **Mr. Sheldon, Mr. Kraft** and **Edward T. Carmody.**

The **Employees Protective Association** of the **Waterbury Clock Company** has sent telegrams to the state's representatives in Washington asking continued protection of the city's clock and watch industry by tariff. Any reduction, Mr. Granger, Vice President of the association declared, would jeopardize the employment of the 2,700 workers in the local plant. Importation of Swiss watches has increased greatly since 1933.

The **Chase Brass & Copper Company,** subsidiary of the **Chase Companies, Inc.,** is expanding its line of gift novelties, a showing of which will take place shortly.

The **Waterbury Buckle Company** elected officers last month as follows: President and treasurer, **Julius B. Smith;** secretary and general manager, **Jerome R. LaVinge;** directors, **Irving H. Chase, John P. Elton, C. Sanford Bull, David C. Griggs, Julius B. Smith, Warren F. Kaynor** and **Jerome R. LaVigne.**

W. R. B.

Connecticut Notes

March 1, 1935.

NEW BRITAIN—Stanley Works reports for last year a profit of $561,488 after allowing for taxes. During the year dividends of $688,000 were paid and $644,000 was set for depreciation although the corporation showed a surplus of $3,799,000 at the end of the year. The concern is now promoting the **National Home Workshop Guild,** an organization for amateur craftsmen, sending out circulars showing how basements can be fitted up into workshops. It is also pushing the **Magic Door,** a device which automatically counts the number of persons entering a theater or other place, this being a development of the Magic Eye which opens a door when the approaching person crosses a certain line of light. A new line of garden tools with extra long handles is bringing large orders. Present assets are $21,000,000 and employees number 4,000.

Landers, Frary & Clark have brought suit in the U. S. District Court in Brooklyn against the **Universal Cooler Corporation** of Detroit, and **Abraham & Straus** of Brooklyn, alleging infringement of the company's trade mark, "Universal."

BRISTOL—The Bristol Brass Corporation at its annual meeting last month, reelected all its officers and directors and added one new director, **James R. Chamberlain.** The company showed a net operating profit of $225,140 for last year as compared with a profit of $305,000, which included an appreciation of $120,000 in inventory, a year ago.

The **American Silver Company** has suspended operations and will be liquidated. Creditors will receive 100 cents on the dollar and the remainder will be set aside for the stockholders. Until recently it has employed 200 hands. It was started in 1857 by the **Bristol Brass Company** and operated as a separate department until 1901 when it was organized as an independent company with a capital of $400,000 with the stock owned by the Bristol Brass Company.

The **American Silver Company,** now in the process of adjustment, and the **Sessions Clock Company** have asked the city board of relief to reduce the tax assessments on their properties.

The **New Departure Company** has the highest tax assessment of any concern in this city according to the assessors report just submitted, amounting to $8,270,185. The other assessments are as follows: **E. Ingraham Company,** $2,039,300; **Wallace Barnes Company,** $1,727,200; **Bristol Brass Company,** $1,497,600; **American Silver Company,** $344,000.

HARTFORD — President Clayton Burt of the **Pratt & Whitney Company** announces the following promotions: **Hubert D. Tanner** to be manager of the machinery division; **Edward J. O'Malley,** superintendent of all manufacturing in both machinery and Keller divisions; **Allen M. Drake,** formerly chief engineer, to be in charge of a new department for development of improved machinery to be used in the production of small tools; **Carroll Knowles,** formerly designing engineer, to be chief engineer in charge of the machinery engineering department; **R. F. V. Stanton,** research engineer of the engineering department; **Eugene Sullivan,** general superintendent of manufacturing and machinery.

BRIDGEPORT — W. R. Webster, chairman of the board of the **Bridgeport Brass Company,** appeared before the NIRA board in Washington last month in behalf of the Manufacturers Association of the state. He recommended modification of the recovery act so as to provide a general 40 hour week, more flexible minimum wage regulations and maintenance of geographical wage differentials, and operation by an employer under the code governing his principal line of business. He said that it is the belief of the manufacturers of Connecticut that there should be a temporary extension of the minimum wage provisions in the codes; opposition to employment of persons under 16; opposition to rigid maximum hour regulation. He urged against any permanent legislation if the desired results are to be accomplished, saying that there should be a readjustment period of a year.

WINSTED — The **William L. Gilbert Clock Company** last month elected **J. J. McClellan** as vice president in charge of sales, reelected **R. E. Thompson** as president and reelected the other officers and directors.

Ralph E. Strand of this city will have to appear in the U. S. District Court of New Haven this month to answer to a suit brought by the **Belden Manufacturing Company** of Chicago, claiming illegal use of formulas for enamel manufacturing and patterns for enamel wire machines, allegedly owned by the **Belden Company.** Mr. Strand, a former employee of that concern came here in 1920 and, with **James T. Sweet,** organized the **Strand & Sweet Company,** makers of enameled wire. This was later sold to the **Polymet Manufacturing Company** which went into bankruptcy a few years ago. After that Mr. Sweet formed the **Winsted Insulated Wire Company.** That concern and the Polymet Manufacturing Company, as well as Mr. Strand are named in the suit.

MILFORD—The Devon Metal Goods Company has increased business so that larger quarters are needed and, if the efforts now being made to obtain them are fruitless, the concern will move out of town, it is said.

W. R. B.

Providence, R. I.

March 1, 1935.

Sadie M. McCarthy has been appointed treasurer of the **Cathedral Art Metal Company** of this city to succeed the late **C. L. Rhodes.** Miss McCarthy has been connected with the organization since 1920.

The **Silverchrist Manufacturing Company,** 144 Pine street, Providence, is owned by the **Paragon Jewelry Company, Inc., M. C. Melone,** Secretary, according to information filed at the city clerk's office.

George B. Hogaboom, research engineer of the Hanson-Van Winkle-Munning Company, Matawan, N. J. and adviser on electroplating to the **United States Bureau of Standards,** at Washington, D. C., was the speaker before the Providence groups of the **American Society for Metals** at a recent meeting in the rooms of the Providence Engineering Society.

The regular monthly meeting for February of the **Metal Finding Manufacturers' Association** was held at Narragansett Hotel, **Frederick A. Ballou Jr.,** president, conducting the business session which followed.

The **Esposito Jewelry Company, Inc.,** has been granted a charter under the laws of Rhode Island to conduct a manufacturing jewelry business at Providence, with an authorized capital of $15,000 divided into 600 shares of common stock at $25 each. The incorporators are: **Vincent A. D'Atri, Maria Esposito** and **Anthony Sanchirico,** all of Providence.

Joseph B. Keenan, Assistant Attorney General of the United States was the principal speaker at the annual banquet of the **New England Manufacturing Jewelers' and Silversmiths' Association** at the Biltmore Hotel, Providence, Saturday evening, February 23. He spoke interestingly on the work of the Federal Government in its campaign against gangsters, racketeers and violators of the NRA with especial reference to matters pertaining to the jewelry industry. Other speakers included: **His Excellency Theodore Francis Green,** Governor of Rhode Island, **Mayor James E. Dunne** of Providence, and **Mayor Frank R. Sweet** of Attleboro and **Dr. W. I. Schurz,** Deputy NRA Administrator in Washington in charge of the jewelry code.

Edwin H. Cummings of Attleboro, Mass., was elected President of the **Manufacturing Jewelers' Board of Trade** at a meeting of the board of directors for organization at Providence, February 15. Other officers selected are: First Vice President, **Alfred K. Potter,** Providence; Second Vice President, **Howard L. Carpenter,** Providence; Secretary and Treasurer, **Horace M. Peck,** Providence; Assistant Secretary and Assistant Treasurer, **Robert C. Knox;** Assistant Treasurer, **Miss Flora M. Andres;** Executive Committee, **Edgar M. Dochert, Edwin H. Cummings** and **Frederick A. Ballou, Jr.**

W. H. M.

Middle Atlantic States

Utica, N. Y.

March 1, 1935.

Slight improvement in business conditions in Central New York was reported for the past month although employment in most of the metal trade factories remained about the same.

Work conditions steadily at the **Bossert Corporation** where men are employed on a large order for the **General Motors Corporation.** A night force is employed.

The **Utica Cutlery Company** is experiencing its annual post season slump.

The **Brunner Manufacturing Company,** Utica, is experiencing good business in both its refrigerator and compressor lines. A rumor that the **Savage Arms Corporation** had a large order which would mean increased employment was denied by the management.

The **Utica Products, Inc.,** is making sheet metal cabinets for air conditioning apparatus.

The general picture in Rome is that employment conditions in brass and copper are not quite so good as they were a month ago.

Newark, N. J.

March 1, 1935.

The **American Platinum Works,** Oliver Street, is erecting a two-story addition to its plant to take care of increased orders.

W. F. Allen Company, manufacturers of calculating machines, has purchased a plant on Jefferson Street, Orange, a short distance from its old factory. This latter concern will move to its new plant and the old factory will be taken over by the **Monroe Calculating Machine Company.**

D. W. Atwater, of Orange, has been appointed manager of the commercial engineering department of the **Westinghouse Lamp Company.** The announcement was made by **David S. Youngholm,** president and general manager. For a number of years Mr. Atwater has cooperated in the design of Westinghouse lighting installations.

Following Newark concerns have been chartered: **Oliver Wire Works,** Inc., metal products, $125,000; **Clemen,** Inc., electrical appliances, 2,500 shares no par.—C. A. L.

Trenton, N. J.

March 1, 1935.

Increase in factory employment, weekly payrolls and average weekly earnings in New Jersey during December are reported by **State Labor Commissioner John T. Toohey.** The gain in employment was slight, but it checked a downward tendency that marked the several preceding months. There were employment advances in 712 establishments, representing 56 of the principal manufacturing industries.

Louis G. Beers, 72 years old, a retired sales manager of the John A. Roebling's Sons Company, died at his home in Trenton, N. J., January 31. Death was due to heart trouble. He came to Trenton in 1900 as sales manager of the **New Jersey Wire Cloth Company,** and continued in the same position when the company was taken over by the Roebling Company.

Following concerns have been chartered here: **Summit Chemical Products Corporation,** Newark, 500 shares, no par; **Roselle Foundry Company,** iron and brass, Elizabeth, $100,000; **Charles G. Johnson Company,** Trenton, chemicals, 2,000 shares; **David Metal Company,** Jersey City, metal products, $30,-000 preferred and 100 shares par.

C. A. L.

Middle Western States

Detroit, Mich.

March 1, 1935.

Industrial conditions in this area are improving from week to week with prospects of still better things as the season advances Production in the nonferrous metal fields is unusually heavy when compared with a year ago. This is brought about, of course, through the automobile industry which is more promising now than it has been since 1929. The same report also comes from the accessory and parts manufacturers, not only in Detroit, but in the neighboring industrial centers as well.

Manufacturers of refrigeration and air conditioning units are active and most of them have increased production schedules. The plating industry has progressed right along with the others and now many of the plants are close to capacity operations.

Not much activity has developed in plumbing and steam fitting manufacture. Many of the plants engaged in this work, however, also produce motor car accessories or parts and consequently are keeping busy.

E. G. Knight Plating Company, Detroit, in the last three months has shown a 600 per cent business increase over the corresponding period of the preceding year, according to **W. B. Knight.**

The January shipments of the Norge **Corporation,** were nearly 13 times greater than in January, 1934, according to **Howard E. Blood,** president. "The demand is especially heavy for kitchen ranges, a new line having been introduced this year," Mr. Blood said.

Business possibilities of the Mueller **Brass Company,** Port Huron, Mich., for 1935, look more favorable than at any time during the last five years, it was announced recently by **President O. B. Mueller.** The company now has about 875 persons on its payroll, as compared

with slightly more than 300 last year at this time.

The **Ford** valve factory at Northville, a suburb, has added 40 men to its payroll to step up production to 48,000 units a day, the amount necessary to keep pace with the production schedule of the organization's new car. More than 300 men are now employed.

Announcement is made of the organization at Holland, Mich., of the **Carl E. Swift Corporation,** which will engage in the manufacture of electric washing machines and other appliances. The officers are **Carl E. Swift,** president; **E. G. Landwehr,** vice president and treasurer; **Henry I. Stimson,** secretary and **Frank E. Stearns,** works manager.

It is reported that the **Briggs Manufacturing Company,** automobile body builders, is considering the opening of a plant which will be devoted to mass production of plumbing supplies. It is understood it will have new offices and also display rooms for the exhibition of kitchen sinks, bath tubs and various plumbing fixtures for the home.

Vincent Bendix, head of the **Bendix Aviation Corporation** at South Bend, Ind., has announced the addition of the **Zenith-Detroit Corporation** at Detroit, to the group of automotive, aircraft and aeronautic subsidiaries under its control. The Detroit concern hereafter will be known as the **Zenith Carburetor Company,** with operations controlled as heretofore in its own plant, according to Mr. Bendix. The executive staff of the Zenith organization will continue to be headed by **Victor Heftler,** general manager, with **B. W. Wescott,** as vice president and assistant general manager assisting him, Mr. Bendix said.

F. J. H.

Toledo, Ohio

March 1, 1935.

Industrial conditions in this area have been making steady progress for the last several weeks. Further improvement seems probable. The motor car industry is making strong demands on accessory manufacturers, most of them at present working almost to capacity. Other lines wherein metals and plating are concerned, also are busy. This probably is the most active season the metal industry has experienced in this section for more than five years.

Approximately $300,000 in additional wages have been granted to employees of the **Electric Auto-Lite Co.** as a result of a recent agreement. Effective Feb. 7, the pact provided for a pay increase of about 7 per cent for some workers and about 5 per cent for others.

The **White Motor Company,** Cleveland, announces a complete line of ultra-modern trucks and busses for 1935.

F. J. H.

Chicago, Illinois

March 1, 1935.

Most of the branches of the non-ferrous metal industry report that business is holding steady with no noticeable increase of orders. Some increase in business has been noted the past month in the plating field. Expansion and remodeling of plants shows a more optimistic outlook.

The **White Cap Company,** manufacturers of tin caps for glass jars, has begun the erection of an addition to their plant at a reported cost of $50,000. The new building will contain 24,000 square feet. The buildings now in use, erected four years ago contains 40,000 square feet, and is at 1806 North Central Avenue, in the Keeney industrial district.

The **La Salle Stove Company,** 445 North La Salle Street, has leased the adjoining building and will remodel both stores in anticipation of a considerable increase in orders during 1935.

Indications that money is now circulating more freely are seen in the Chicago branch of the **Chase Brass & Copper Company** which reports that the credit department is showing a marked improvement in collections. Many accounts of long standing have recently been settled.

E. J. Kelly of the **Chicago Brass Works** states that, while there have been no outstandingly large orders recently a continuous stream of small orders has helped to maintain a steady level of business. A few additional men are being put on.

The series of sales meetings held the past month in all distributing centers by **Fairbanks, Morse & Company** has been responsible for a satisfactory increase in sales, as a result of acquainting the field with the new models in refrigerators and radios.

Kelvinator's factory-operated sales branch in Chicago, in common with five other branches, is preparing for the entrance of the **Kelvinator Corporation** into the electric range field. It is expected that production will begin early in April and first shipments will follow immediately thereafter. Temporarily the new product will be sold exclusively through the six factory-operated sales branches, but the corporation's already established selling channels will be used later.

An encouraging increase in a number of lines of plating, notably chromium, is being felt by the **McVittie Plating and Brass Refinishing Company.** The company does a large business in plating silver for hotels from coast to coast and a larger volume of these orders has been received recently, according to **James McVittie,** president.

A meeting of the District Code Committee of the Electro-Plating Industry was held February 19 at the Hamilton Club, at which **A. E. O'Connell,** Field Representative for the Fabricated Metals Code Authority was present. **F. J. Hanlon,** Chicago City Plating Company, is the local code authority.—R. G. K.

Pacific States

Los Angeles, Calif.

March 1, 1935.

Mrs. A. S. C. Forbes of 335 West 35th St. has the only foundry in the country, making toned replicas of the historic mission bells of the Pacific Coast. These bells range from three ounces to 1,800 pounds.

The **Fugit Smokeless Orchard Heater Co.** of 700 Date St., Alhambra, are making a new heater for frost prevention in the orchards, using 20 to 25 heaters to the acre. Butane is used to produce the heat, the heaters are connected by a fuel line and a needle valve and a large control tank is erected to hold the butane. The whole system is thermostatically controlled.

The **United States Spring & Bumper Company** of East 50th and Magnolia Sts., have enlarged their plating department, doubled the motor used, added a lot of new machinery, enlarged laboratory, increased production of all lines of springs, bumpers, guard rails, farm tools and equipment.

The **Oil Pure Refiner Company** of 308 North San Fernando Road, Glendale, are making a new metal oil purifier.

C. W. Ferguson of 1737 Orange Grove, Hollywood, is making a specialty of making copper and brass art goods.

Clemens Friedell of 628 East Colorado St., Pasadena, is devoting his time to making silver ornaments.

F. E. Olos & Son of 1914 Raymond Ave., have orders ahead for six months, for band instruments, made of brass, steel, copper and aluminum.

The **Williams Band Instrument** factory at 432 South Main St., are several months behind orders for their trombones.

The **Gil Rite Hard Fuel Orchard Heater Company** of 209 South McClay St., San Fernando, are putting out a special orchard heater.

The **Electric Equipment Company** of 1240 South Hope St., have acquired the assets of the **Pacific Automotive Service** and they have been appointed South California distributor for the **Bendix** products made at South Bend, Ind.

The **Pacific Signal Company** of 3517 Virginia Ave., Lynwood, are making new illuminated boulevard, stop and flashers. They are in big production.

The **Arnite Laboratories** of 1900 East 65th St., are making a new packing for leaks in pipes and bearings, which is a mixture of asbestos, cotton, fine metallic lead. Even where corroded, 70 per cent lead is used and especially good for pipe around acids, water, alkalies, salines, gas, oil and petroleum products.—H. S.

The North Pacific

March 1, 1935.

The **Bristol Company** of Waterbury, Conn., have enlarged their laboratory for the Pacific Coast at San Francisco, to develop and manufacture recording and controlling equipment. **S. W Case** is manager there. **W. H. Rogers** is manager at Los Angeles.—H. S.

Metal Market Review

March 1, 1935.

The metal market, on the whole in February, was dull. Most changes were downward in direction. The long-awaited gold clause decision of the Supreme Court made little, if any, difference.

Copper remained unchanged throughout the month at 9c for electrolytic. Prospects, however, are not discouraging. North and South American refined stocks declined 16,000 tons in January. Sales of Blue Eagle copper totalled 25,600 tons up to February 26th, and the demand continued to show a satisfactory increase.

An important piece of news is the fact that an international copper conference will be held early in March between representatives of several large American and foreign producers.

Zinc was steady at 3.70, the first three weeks of the month and then rose to 3.75 and 3.80 at the close. January statistics showed a gain in shipments which kept the stocks of metal almost stationary. Progress toward effecting a curtailment of production has been reported.

Tin was decidedly reactionary. Beginning the month at 51 it began to slip during the second week, but its movements were not wide until the last two weeks when it took a nose dive, closing the month at 47.35. The reason for this serious unsettlement is said to have been the public criticism of the International Cartel and the liquidation of a private pool organized in London.

The Tin International Committee has put off establishing production quotas until March 14 because of the uncertainty in American operations.

Figures show that apparent American consumption of tin dropped from 58,793 long tons in 1933 to 43,601 long tons in 1934. Actual consumption exceeded the above 1934 figure by about 10,000 tons, the difference coming out of stocks. Consumption of tin in bearing metals increased 10.9 per cent and in solder, 21.8 per cent. The big decrease was in the tin plate industry which, as reported in our November issue, declined by 13,500 tons to 44,375.

Lead opened the month at 3.35 where it continued for about a week after which it rose to 3.40 and remained there. Subsequent buying was not very active, however, until the latter part of the month when it improved.

January statistics showed that consumption was going on at about the same rate as in the previous month; production was reduced enough to cut stocks of metals about 3,460 tons.

Aluminum was unchanged at 22.

Nickel was unchanged at 35.

Antimony was unchanged at 14.50, with buying dull.

Silver spent the first half of the month around 53.75 to 53.875 but strengthened perceptibly, closing sharply higher at 56.50. One of the reasons for this strength were purchases for the account of India and China.

The Bureau of Mines summary of silver operations for 1934 shows that the high domestic market for silver reopened a few mines in the United States which had ore reserves high in silver value; also helped to keep a number of silver lead mines from closing down. Mine production in 1934 totalled 31,947,574 ounces valued at $20,638,133, compared with 23,286,866 ounces valued at $8,150,403 in 1933.

Platinum sank another dollar to $32 per ounce.

Scrap metals followed the primary market, being slow to slightly weak; even aluminum joined in this trend. Brass ingot orders improved a little in the second week, remained steady for the third week and more active toward the close of the month. During that time copper, brass and tin scrap reflected the decline abroad.

Ingot brass and bronze shipments during the calendar month of December amounted to 3,688 net tons according to a report of the Code Authority.

Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on Commercial Grades of six principal mixtures of Ingot Brass during the twenty-eight day period ending February 22.

Commercial 80-10-10 (1½% Impurities)	9.786c
Commercial 78% Metal	7.515c
Commercial 81% Metal	7.750c
Commercial 83% Metal	8.021c
Commercial 85-5-5-5	8.271c
Commercial No. 1 Yellow Brass	6.529c

WROUGHT METAL MARKET

The brass mills' orders operations compared fairly well with the pre-Christmas figures, following the improvement in the middle west, stimulated by the automobile industry activity. Distributors found the month spotty at some times and fair at others. One important jobber reported that February, 1934, had run about 10 to 12 per cent above February, 1933.

Daily Metal Prices for February, 1935

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4	5	6	7	8	11	12*	13	14	15	18
Copper c/lb. Duty 4 c/lb.												
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	9.125	9.125	9.125	9.125	....	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	....	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.50	7.50	7.50	7.50	7.50	7.50	7.50	....	7.50	7.50	7.50	7.50
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¾ c/lb.												
Prime Western (for Brass Special add 0.05)	3.70	3.70	3.70	3.70	3.70	3.70	3.70	....	3.70	3.70	3.70	3.70
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.00	51.05	51.125	51.15	51.20	51.10	50.75	....	50.30	49.85	50.00	50.45
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	3.35	3.35	3.35	3.35	3.35	3.35	3.35	....	3.40	3.40	3.40	3.40
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	22.00	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.												
Electrolytic 99.9%	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	14.50	14.50	14.50	14.50	14.50	14.50	14.50	....	14.50	14.50	14.50	14.50
Silver c/oz. Troy, Duty Free	53.875	53.875	53.875	53.75	53.875	53.875	53.875	....	53.875	54.375	54.75	54.75
Platinum $/oz. Troy, Duty Free	33.00	33.00	33.00	33.00	33.00	33.00	33.00	....	33.00	33.00	32.00	32.00
Gold—Official Price[1] $/oz. Troy	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00

	19	20	21	22*	25	26	27	28	High	Low	Aver.
Copper c/lb. Duty 4 c/lb.											
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	....	9.125	9.125	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	....	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.50	7.50	7.50	....	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¾ c/lb.											
Prime Western (for Brass Special add 0.05)	3.70	3.70	3.70	....	3.75	3.75	3.80	3.85	3.85	3.70	3.719
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	50.35	50.25	49.90	....	48.10	47.75	47.625	47.35	51.20	47.35	49.961
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	3.40	3.40	3.40	....	3.40	3.40	3.40	3.40	3.40	3.35	3.380
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.											
Electrolytic 99.9%	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	14.50	14.50	14.50	....	14.50	14.50	14.50	14.50	14.50	14.50	14.50
Silver c/oz. Troy, Duty Free	55.25	55.25	55.25	....	55.375	55.50	56.25	56.50	56.50	53.50	54.602
Platinum $/oz. Troy, Duty Free	32.00	32.00	32.00	....	32.00	32.00	32.00	32.00	33.00	32.00	32.250
Gold—Official Price[1] $/oz. Troy	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00	35.00	35.00

‡ Blue Eagle Copper. [1] United States Treasury price.
* Holiday.

Metal Prices, March 4, 1935

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.125, Electrolytic, 9.00, Casting, 7.75.
Zinc: Prime Western, 3.90. Brass Special, 4.00.
Tin: Straits, 47.35. Pig 99%, 46.50.
Lead: 3.40. **Aluminum,** 22.00. **Antimony,** 14.50.
Nickel: Shot, 36. Elec., 35.

Quicksilver: Flasks, 75 lbs., $73.00. **Bismuth,** $1.10.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., March 4, 58.00c. **Gold:** Oz., Troy, Official U. S. Treasury price, March 4, **$35.00. Scrap Gold,** 6¾c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $32.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free, lead, 2⅛c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Import Duty	Tax*
Brass Ingots, Yellow	6½ to 8	None	4c. lb.[1]
Brass Ingots, Red	8¼ to 11	do	do
Bronze Ingots	9¾ to 12½	do	do
Aluminum Casting Alloys	15½ to 22	4c. lb.	None
Manganese Bronze Castings	20 to 34	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	26 to 38	do	do
Manganese Bronze Ingots	9 to 13	do	4c. lb.[1]
Manganese Copper, 30%	11½ to 16	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	28	do	None
Phosphor Bronze Ingots	10 to 12	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	13¼ to 15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	11½ to 14	do	do
Phosphor Tin, no guarantee	61 to 75	None	None
Silicon Copper, 10%	18 to 30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$34-35	None	None
Iridium Platinum, 10%	$35-36	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:

	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6⅜ to 6⅝	Free	4c. per pound on copper content.
Light copper	5½ to 5¾	Free	
Heavy yellow brass	3⅜ to 3⅝	Free	
Light brass	3 to 3⅛	Free	
No. 1 composition	4⅞ to 5⅛	Free	
Composition turnings	4⅝ to 4⅞	Free	
Heavy soft lead	3 to 3¼	2⅛c.lb.	None.
Old zinc	2¼ to 2⅜	1½c.lb.	
New zinc clips	2¾ to 3	1½c.lb.	
Aluminum clips (new, soft)	12¼ to 13¼	4c.lb.	
Scrap aluminum, cast	9¼ to 10	4c.lb.	
Aluminum borings—turnings	5 to 5½	4c.lb.	
No. 1 pewter	30 to 32	Free	
Electrotype or stereotype	2⅞ to 3	2⅛c. lb.*	
Nickel anodes	30 to 33	10%	
Nickel clips, new	31 to 33	10%	
Monel scrap	11 to 18½	10% a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since November 24, 1934. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	16c.	2½c. lb.
Bare wire, soft, less than carloads	12.75c.	25% a. v.
Seamless tubing	16.25c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	23.50c.	10% Quality	26.375c.
15% Quality	25.625c.	15% Quality	30.75c.
18% Quality	26.875c.	18% Quality	34.00c.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	14¼c.	15¼c.	16	4c. lb.	U. S. Import Tax 4c. lb. on copper content
Wire	14¾c.	15¾c.	16½	25%	
Rod	12¾c.	15¾c.	16⅜	4c. lb.	
Angles, channels	22¼c.	23½c.	24	12c. lb.	
Seamless tubing	16 c.	16¾c.	17⅝	8c. lb.	
Open seam tubing	22¼c.	23½c.	24	20% a. v.	No tax.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.; import tax 4c. lb. on copper content.)

Tobin Bronze Rod	16¼c.
Muntz or Yellow Rectangular and other sheathing	17⅜c.
Muntz or Yellow Metal Rod	13¾c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.80
Aluminum coils, 24 ga., base price, tons lots, per lb.	30.50

ROLLED NICKEL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	.35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	.40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (March 4) 59¼c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	7.00	2⅜c. lb.
Cut Lead Sheet (base price)	7.25	2⅜c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Brittannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 116.

Supply Prices, March 4, 1935

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast		16½c. per lb.
	Electrolytic, full size, 14c.; cut to size	14c. per lb.
	Rolled oval, straight, 14½c.; curved,	15½c. per lb.
Brass: Cast		14½c. per lb.
Zinc: Cast		.08¼c. per lb.
Nickel: 90-92%		.45 per lb.
	95-97%	.46 per lb.
	99%+cast, 47c.; rolled, depolarized, 48.	

Silver: Rolled silver anodes .999 fine were quoted March 4, from 61c. per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85

Any Quantity

4 to 6	Under ½, $5.00	½-1, $4.85	1 to 3, $4.75
1½ to 4	" 5.55	" 5.40	" 5.35
1 to ½	" 5.85	" 5.70	" 5.60

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick. On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less were quoted July 2:

16" 20 ply 84/92 Unbleached	$86.21
14" 20 ply 84/92 Unbleached	66.06
12" 20 ply 84/92 Unbleached	49.63
16" 20 ply 80/92 Unbleached	71.02
14" 20 ply 80/92 Unbleached	54.50
12" 20 ply 80/92 Unbleached	41.04
16" 20 ply 64/68 Unbleached	63.43
14" 20 ply 64/68 Unbleached	48.73
12" 20 ply 64/68 Unbleached	36.75

⅜" Sewed Buffs, per lb., bleached or unbleached 49c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.13½-.16
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 400 or 100 lb. drums		.15¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.13½-.14½
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½.-05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.14½-.16½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) 100% synth., drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13-.14
Salts, double, 425 lb. bbls.	lb.	.13-.14
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07½-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.08⅝
Carbonate, 96-98%	lb.	.08¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Gold Cyanide	oz.	$15.45*
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.48
Cyanide, 100 oz. lots	oz.	.53½
Nitrate, 100 ounce lots	oz.	.40
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF. BeF_2$)	lb.	4.30-7.00
Gold Cyanide	oz.	$17.10*
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.55-3.70
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, drums	lb.	.33-.36
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.37
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.38
Chloride, drums, bbls.	lb.	.07½-.10
Sulphate, bbls.	lb.	.03-.037

* Gold and silver products subject to fluctuations in metal prices.

SINCE 1849

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Hairpin Machines
Badge Pin Machines
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Pin Ticket Machines
Staple Machines

Buckle Machines
Chain Machines
Corset Buckle & Loop Machines
Dress Fastener Machines
Dress Hook and Eye Machines
Suspender Buckle Machines
Toilet Pin Machines
Hardware Parts Machines
Paper Clip Machines
Ribbon Metal Forming Machines
Thumbtack Machines

Bushing Machines
Chain Roller Machines
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Piano Action Hardware Machines
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and so on.

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